

# Journal of Space Law

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# **JOURNAL OF SPACE LAW**

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**Founder, Dr. Stephen Gorove (1917-2001)**

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## FROM THE EDITOR

Issue 47.2 of the *Journal of Space Law* provides thought-provoking scholarship, addressing critical questions in our field. As we stand at the threshold of a new era in space exploration, this issue reflects the deep scope, complexity and urgency of governing humanity's activities beyond Earth.

The issue starts with a question: what is a celestial body? It seems simple enough until you consider the legal stakes tied to planets, asteroids, and everything in between. This article digs into the definitions that shape treaties and policies, a puzzle that's been close to my heart since my son first asked me about asteroid mining years ago. Next, we explore the impact of special relativity on law in deep space missions. When time itself bends at relativistic speeds, how do we apply jurisdiction or enforce contracts? Our third article applies Michel Foucault's theories to the growing commercial space sector, examining how power and regulation intersect as corporations vie for dominance in orbit. We then turn to UAPs—no longer UFOS, but unidentified aerial phenomena—and their legal implications. Whether advanced technology or something else, UAPs force us to consider how space law adapts to the unknown, raising questions of sovereignty, security and evidence. Shifting focus, the issue carries on with a comparative assessment of Chinese and US approaches to uncontrolled reentry of space objects. Our exploration then continues with an assessment of space-defense relationships in international organizations and concludes with a high-level overview of intellectual property in space.

Editing is always a privilege, a chance to engage with brilliant minds pushing the boundaries of space law. A thanks to our authors, peer reviewers and student editors for your tremendous contributions. I hope the *Journal* continues to inspire you to look upward—not just in wonder, but with a commitment to shaping a legal framework worthy of the stars.

Michelle L.D. Hanlon  
Editor-in-Chief  
Oxford, Mississippi

# PROTECTING THE COSMOS: THE NEED TO DEFINE CELESTIAL BODIES IN THE OUTER SPACE TREATY

*David A. Epstein\**

## ABSTRACT

The lack of a clear definition of the term “celestial bodies” as used in the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty or OST) risks exporting legal and political conflict into the cosmos. With advancing technology and expanding extraterrestrial human activity, nations, private enterprise and even individuals could engage in a free-for-all to test the boundaries of what is permissible in outer space, risking legal or even armed conflict. Through national and international measures, clear criteria defining what is and is not a “celestial body” must be established to avoid misunderstanding and miscalculation, and to provide meaning to the term as used in the Outer Space Treaty. Attempts to address this issue have largely focused on broad, and often binary, approaches to determining what “celestial bodies” are or are not. Work to address this issue, however, has been limited and rendered somewhat obsolete given technological

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\* United States Foreign Service Officer; former visiting professor of Space Policy at United States Air Force Academy. The views expressed are the author's own and not necessarily those of the US Government. This article is dedicated to my wife, Shani, who is the sun and the Moon and the stars of my life, and to my three boys: may they dream of infinite possibility in an infinite universe. The author would like also to acknowledge that the article and the research behind it would not have been possible without the incredible support and encouragement of Michelle L.D. Hanlon, Executive Director, Center for Air and Space Law, University of Mississippi; Editor-in-Chief of the Journal of Space Law and the Journal of Drone Law and Policy; Co-Founder and President of For All Moonkind, Inc., a nonprofit corporation that is the only organization in the world focused on obtaining international legal recognition for and protection of human cultural heritage in outer space; President Emeritus of the National Space Society. Her wisdom and enthusiasm for this topic and the encouragement it provided inspired me to keep thinking, learning, and pursuing this project to its end.

advancements, as well as national and multilateral policy and legal changes in the field. While past scholarship is helpful in framing the issue, it fails to propose a universal and holistic approach that takes emerging technological developments into account alongside these national and multilateral policy and legal developments. Instead of seeking to determine whether vast classes of objects are “celestial bodies” or not, a far more nuanced approach should be taken that actually enumerates and catalogues those objects that will be considered “celestial bodies” for the purposes of the OST. Moreover, these efforts should also clearly demarcate where the jurisdiction of the OST ends by declaring its writ to extend to the limits of the solar system and no farther. By providing a multi-tiered and finite approach to the problem, this article can instantly help frame the discussion to ensure the exploration and use of outer space for peaceful purposes as envisioned by the OST.

## I. INTRODUCTION

On June 13, 2010, a streak of light split the sky over Woomera Test Range in Australia. Described as “breathtakingly beautiful,”<sup>1</sup> it was not an entirely natural phenomenon, but it was nevertheless jaw-droppingly spectacular and record-breaking. The light marked the entry into the atmosphere of the Japan Aerospace Exploration Agency’s (JAXA) Hayabusa spacecraft, the first ever human object to land on an asteroid—a near-Earth object named Itokawa—and return to Earth with a sample of material from that object.<sup>2</sup> Scientists describe Itokawa as “a ‘rubble pile’ loosely held together by gravity.”<sup>3</sup> While the spacecraft itself was incinerated, a heat-shielded capsule landed carrying “1,500 tiny particles” most of

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<sup>1</sup> Ken Kremer, *Japanese Asteroid Lander Hayabusa Plunges Home to Earth*, SPACEREF (June 13, 2010), <https://spaceref.com/uncategorized/japanese-asteroid-lander-hayabusa-plunges-home-to-earth/>.

<sup>2</sup> Dennis Normile, *Japan’s Hayabusa2 Capsule Lands with Carbon-rich Asteroid Samples*, SCIENCE (Dec. 7, 2020), <https://www.science.org/content/article/japan-s-hayabusa2-capsule-lands-carbon-rich-asteroid-samples> (last visited Sept. 17, 2023).

<sup>3</sup> Paul Scott Anderson, *Asteroid Itokawa Gives Up Its Secrets*, EARTHSKY.ORG (Sept. 8, 2018) <https://earthsky.org/space/dust-grains-returned-from-asteroid-itokawa-by-hayabusa-reveal-its-age-and-history/>.



which were determined to be from Itokawa.<sup>4</sup> On average, the particles were just “one-tenth the width of a human hair.”<sup>5</sup>

The fundamental precept of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (Outer Space Treaty or OST) is that the exploration and use of outer space are “the province of all [hu]mankind”<sup>6</sup> and “shall be carried out for the benefit and in the interests of all countries.”<sup>7</sup> The OST also provides that there “shall be freedom of scientific investigation in outer space, including the Moon and other celestial bodies.”<sup>8</sup> While the Treaty provides that “there shall be free access to all areas of celestial bodies,”<sup>9</sup> Article II is clear that “outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.”<sup>10</sup>

The United States (US) has signaled, through its national law,<sup>11</sup> and through the development and execution of international agreements such as the Artemis Accords,<sup>12</sup> that it interprets Article

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<sup>4</sup> Wendy Zukerman, *Spacecraft is First to Bring Asteroid Dust to Earth*, NEWS SCIENTIST (Nov. 16, 2010), <https://www.newscientist.com/article/dn19730-spacecraft-is-first-to-bring-asteroid-dust-to-earth/>.

<sup>5</sup> Elizabeth Howell, *Hayabusa: Troubled Sample Return Mission*, SPACE.COM (Mar. 30, 2018), <https://www.space.com/40156-hayabusa.html>.

<sup>6</sup> The author would urge that future developments in space law should employ the inclusive term “humanity” rather than the more limiting, exclusionary, and etymologically archaic “mankind” in reference to the human race and human civilization. EDITOR’S NOTE: it has been the policy and practice of the *Journal of Space Law* to use the terms “human,” “humanity” and “humankind” since 2018.

<sup>7</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, art. I, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

<sup>8</sup> *Id.*

<sup>9</sup> *Id.*

<sup>10</sup> *Id.* at art. II.

<sup>11</sup> See e.g., US Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, §§ 101-403, 129 Stat. 704, 704-22 (2015).

<sup>12</sup> The Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids, NASA, <https://www.nasa.gov/specials/artemis-accords/img/Artemis-Accords-signed-13Oct2020.pdf> [hereinafter Artemis Accords]. The original signatories were representatives from Australia, Canada, Italy, Japan, Luxembourg, the United Arab Emirates, the United Kingdom, and the United States; these original parties have (as of this writing) since been joined by Bahrain, Brazil, Colombia, France, The Isle of Man, Israel, South Korea, Mexico, New Zealand, Poland, Romania, Singapore, Ukraine, Rwanda, and Nigeria.

II to mean that it is permissible, particularly for private enterprises and individuals, to extract and utilize resources from space, including the Moon and other celestial bodies without running afoul of the provisions of Article II of the Outer Space Treaty or any other international law or obligation. As of December 13, 2022, 23 nations have signed the Artemis Accords, indicating their agreement with this interpretation.<sup>13</sup> However, this understanding merely scratches the surface of the implications and meaning of Article II.

Deconstructing the language of Article II suggests that it may have truly been intended to restrict national—versus private—appropriation. Moreover, as we consider space with far more knowledge than we had in the 1960s, when the Outer Space Treaty was negotiated, we must consider what is meant by the term “celestial body,” and even the term “outer space” itself. On the one hand, the language of Article II suggests that nothing in space, including an orbital slot, or even the energy generated by our sun, may be “appropriated.” Yet it would be absurd to apply that literal a meaning to Article II. Are parties to the Outer Space Treaty obligated not to “appropriate” even a miniscule speck of cosmic dust? If the resources contained in a so-called “celestial body” are extracted to the point where the celestial body disappears, does that cross a threshold into appropriation?

With all this in mind, the argument can certainly be raised that Japan must share these 1,500 particles with the rest of humanity. Of course, JAXA shared its bounty with allied nations and scientific results were made publicly available.<sup>14</sup> And indeed, no State Party to the OST objected to this mission to retrieve space resources, just as no nations objected when the Soviet Union, the United States, and then China returned sample material from the Moon. Certainly, it would feel absurd to argue that the collection of 1,500 particles smaller than a human hair for the purposes of scientific discovery collected from a pile of rubble held together by gravity violates the substance or purpose of the Outer Space Treaty.

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<sup>13</sup> White House Statement, *Strengthening the US-Africa Partnership in Space*, THEWHITEHOUSE (Dec. 13, 2022), <https://www.whitehouse.gov/briefing-room/statements-releases/2022/12/13/statement-strengthening-the-u-s-africa-partnership-in-space/>.

<sup>14</sup> *Hayabusa Project*, JAXA, <https://darts.isas.jaxa.jp/planet/project/hayabusa/index.html> (last visited Nov. 1, 2023).

Fast forward just one decade. In December 2020, another JAXA mission, Hayabusa 2, returned to Earth carrying 5.4 grams of soil and rock gathered from another collection of gravitationally bound fragments, this one named Ryugu.<sup>15</sup> Again, the collection was made in the name of science and no doubt provided a benefit to humanity by assisting in our understanding of the cosmos. The United States, also a signatory to the Outer Space Treaty, likewise launched an asteroid sample-return mission (OSIRIS-REx [Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer]), which successfully touched down on and collected a sample from its target asteroid. OSIRIS-REx returned to Earth on September 24, 2023.<sup>16</sup>

By extrapolating from Moore's Law<sup>17</sup> of exponential technological growth and applying it to the rapid developments in space launch technology, and one can imagine, just a decade or so from now, not a return mission that retrieves a scientific sample, but a commercial operation that lands on an asteroid to mine its resources solely for commercial benefit. It could even be that the asteroid would be mined literally out of existence. Can this be permissible under the Outer Space Treaty? Each of the asteroids targeted by Japan and the United States for sample-return missions range in size from 330 meters to 1 kilometer in diameter and each have names (162173 Ryugu, 25143 Itokawa, and 101955 Bennu). Are they to be considered "celestial bodies?" Does it make sense to limit the definition of "celestial bodies" based on size (or even whether the objects are named)?

The Outer Space Treaty employs the term "celestial bodies" repeatedly throughout its text. However, the term has never been concretely defined in an academic, scientific, or legal context. While the lack of any definitional clarity has not, heretofore, caused any

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<sup>15</sup> Shiori Ogawa, *'Building Blocks of Life' Found in Soil Taken from Asteroid Ryugu*, ASAHI.COM (June 6, 2022), <https://www.asahi.com/ajw/articles/14638613>.

<sup>16</sup> OSIRIS-Rex, NAT'L AERONAUTICS AND SPACE ADMIN., <https://science.nasa.gov/mission/osiris-rex/> (last visited Dec. 30, 2023).

<sup>17</sup> Gordon Moore predicted that the number of transistors per square inch on an integrated circuit would double approximately every two years. In 1975, chips held 10,000 transistors each. Today that number is 50 billion. See Tina Sieber, *What is Moore's Law and Is it Still Relevant in 2022?*, MAKEUSOF.COM (Mar. 15, 2022), <https://www.makeuseof.com/tag/what-is-moores-law-and-what-does-it-have-to-do-with-you-makeuseof-explains/>.

difficulties to humanity writ large, advances in technology will soon empower governments, public and private enterprises, and even private citizens to engage in extraterrestrial activities that will be impacted by how the term “celestial bodies” is defined or interpreted.<sup>18</sup> How we think about and define “celestial bodies” will impact the application of and limitations imposed by Article II.

Steven Gorove posed the question this way in 1969:

Does the prohibition extend to the collection of dust particles or other special elements during flight in outer space? Does the prohibition extend to the appropriation of cosmic rays, gases or the sun’s energy, or to the collecting of mineral samples or precious metals on the Moon or other celestial bodies? Should the answer depend on the type of resource involved, or on its availability in unlimited (cosmic rays, meteorites, gases) or limited (minerals, metals) quantities or perhaps on its location?<sup>19</sup>

Further, does the concept extend to objects that came to Earth naturally as opposed to those brought back by human intervention?<sup>20</sup> And finally, are any intangible cosmic phenomena, such as Lagrange points, to be included as a “celestial body?”

All of these questions remain unanswered.

This article analyzes the language of Article II of the OST, considering what is meant by the concept of appropriation and argues that: 1) Article II was not intended to reach private non-State entities; 2) the Outer Space Treaty does not prohibit the appropriation or extraction of resources from extraterrestrial objects that do not fall within the meaning of the term “celestial bodies” and 3) that the term “celestial body” itself should be limited and clearly defined. This article will also explore some prior approaches to these same questions and ways in which they require further elaboration. That said, the focus of this article is on the term “celestial body” with

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<sup>18</sup> David A. Epstein, *Boosting Space Diplomacy at State*, FOREIGN SERV. J. (2022), <https://afsa.org/boosting-space-diplomacy-state>.

<sup>19</sup> Stephen Gorove, *Interpreting Article II of the Outer Space Treaty*, 37 FORDHAM L. REV. 349, 350 (1969).

<sup>20</sup> *Id.* (“With respect to location, it could be argued that if any parts of outer space, including the Moon and other celestial bodies, were found on the earth, they would not be subject to the prohibition of national appropriation since they would become part and parcel of the earth. Under a strict interpretation it may also be argued that the prohibition extends to the resource irrespective of its location”).

some consideration, too, to the extent of the application of terrestrial space law in general and, thus, the definition of “outer space” itself.

Part II of this article reviews space law in general and focuses on the language contained in Article II of the Outer Space Treaty. Part III analyzes the term “celestial bodies” from a historical standpoint and within the context of the Outer Space Treaty, also explaining why a definition is important. Part IV reviews different definitions of “celestial bodies” that have been offered and Part V provides the author’s proposed solution.

## II. THE SPACE TREATIES

### A. *Generally*<sup>21</sup>

In October 1957, Sputnik 1 became the first human-made object to reach space.<sup>22</sup> Shortly thereafter, the United Nations (UN), “[r]ecognizing the common interest of [hu]mankind in outer space...and that it is the common aim that outer space should be used for peaceful purposes [and] [w]ishing to avoid the extension of present national rivalries in this new field,”<sup>23</sup> created an ad hoc committee to, among other things, report on the “nature of legal problems which may arise in the carrying out of programmes to explore outer space.”<sup>24</sup> The Committee on the Peaceful Uses of Outer Space (COPUOS) was made a permanent body in 1959.<sup>25</sup> COPUOS was the backdrop for negotiation and implementation of the treaties which today govern space activities.

Five treaties related to sovereign space activities were negotiated in the COPUOS, colloquially known as the Outer Space

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<sup>21</sup> Parts II.A and II.B. of this article were prepared with Michelle L.D. Hanlon and initially presented at the Space Resources Roundtable at the Colorado School of Mines in Golden, Colorado on June 9, 2022.

<sup>22</sup> *Sputnik 1*, NAT’L AERONAUTICS AND SPACE ADMIN, <https://www.nasa.gov/image-article/sputnik-1/> (last visited Sept. 17, 2023).

<sup>23</sup> G.A. Res. 1348 (XIII) (Dec. 13, 1958).

<sup>24</sup> *Id.*

<sup>25</sup> G.A. Res. 1472 (XIV) (Dec. 12, 1959).

Treaty,<sup>26</sup> Rescue Agreement,<sup>27</sup> the Liability Convention,<sup>28</sup> the Registration Convention<sup>29</sup> and the Moon Agreement.<sup>30</sup> As their names suggest, these agreements respectively offer principles and guidelines to govern sovereign space activities generally as well as more detailed guidance on how States should act in relation to the rescue of astronauts; responsibility and liability for damage caused by space objects; and the registration of objects launched or intended to be launched into orbit. The Moon Agreement, which suggests that States should consider developing a regulatory regime to govern lunar resource mining when such activity is likely to occur, has been ratified by only eighteen States.<sup>31</sup> None of the major spacefaring nations, including China, the United States or Russia, has done so. And indeed, in April 2020, then-US president Trump issued an Executive Order which made clear both: 1) the United States' unwillingness to enter into the Moon Agreement; and 2) the US strategy to object to "any attempt to . . . to treat the Moon Agreement as reflecting or otherwise expressing customary international law."<sup>32</sup>

Negotiated during the Cold War essentially by the world's two superpowers, the four widely ratified treaties reflect a remarkable—and to date successful—*détente*. The overriding concern was, as the name of the COPUOS suggests, peace. As they hammered out the *Magna Carta* for peace in space, the negotiators cannot be faulted for not considering an environment where, as today, private entities could perform all the space activities once reserved for State actors—and very few State actors at that. As a result, peace, collaboration, and freedom<sup>33</sup> are the regime's key principles, while

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<sup>26</sup> Outer Space Treaty, *supra* note 7.

<sup>27</sup> Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Apr. 22, 1968, 19 UST. 7570, 672 UNT.S. 119 [hereinafter Rescue Agreement].

<sup>28</sup> Convention on the International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 UST. 2389, 961 UNT.S. 187 [hereinafter Liability Convention].

<sup>29</sup> Convention on Registration of Objects Launched into Outer Space, Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

<sup>30</sup> Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1362 UNT.S. 3 [hereinafter Moon Agreement].

<sup>31</sup> *Id.*

<sup>32</sup> Exec. Order No. 13914, 85 Fed. Reg. 20, 381 (Apr. 6, 2020).

<sup>33</sup> Article I of the Outer Space Treaty encompasses three foundational aspects of all space activities: the exploration and use of space is the "province" of all humankind; space, including the Moon and other celestial bodies "shall be free for exploration and use by all States;" and "States shall facilitate and encourage international co-operation"

other increasingly important matters, including cultural heritage preservation and private resource mining and utilization are un-addressed.

That said, the activities of private entities are not entirely overlooked. Article VI of the Outer Space Treaty makes it quite clear that States bear “international responsibility for national activities in outer space...whether such activities are carried on by governmental agencies or by non-governmental entities.”<sup>34</sup> The Article further indicates that States must assure that all “national activities are carried out in conformity with the provisions set forth” in the Treaty.<sup>35</sup>

### B. Article II

Article II of the Outer Space Treaty states in full: “[o]uter space, including the Moon and other celestial bodies is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.”<sup>36</sup>

#### i. Sovereignty

The international community seems largely to agree that no sovereign may make a claim to extraterrestrial territory. Indeed, it is a principle so embedded in the bedrock of space exploration as to be considered by many to be not just a treaty obligation but customary international law.<sup>37</sup> Nevertheless, a colorable argument can be made that this particular provision does not apply to non-State entities.

First, the Article plainly indicates that space shall not be subject to *national* appropriation. Second, the primary restriction is against appropriation by claiming *sovereignty*. Arguably, then, if a non-State entity asserts proprietary rights, it is not a “national appropriation,” nor is it “by claim of sovereignty.” This interpretation

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in scientific investigation. Outer Space Treaty, *supra* note 7, art. I. Article IV avers that “the Moon and other celestial bodies shall be used...exclusively for peaceful purposes.” *Id.* at art. IV.

<sup>34</sup> *Id.* at art. VI.

<sup>35</sup> *Id.*

<sup>36</sup> Outer Space Treaty, *supra* note 7, art. II.

<sup>37</sup> Fabio Tronchetti, *The Non-Appropriation Principle Under Attack: Using Article II of the Outer Space Treaty in Its Defence*, 50 PROC. L. OUTER SPACE 526, 530 (2007).

is supported by the United Nations Declaration of Human Rights, which, in Article 17 plainly states that “[e]veryone has the right to own property alone as well as in association with others.”<sup>38</sup> The Declaration applies to space activities through Article III of the Outer Space Treaty which requires States to “carry on activities in...space in accordance with international law.”<sup>39</sup> Surely, this would require States to support and defend fundamental human rights even in a space environment. As such, arguably, it would be a violation of international law not to permit ownership in space.

As Stephen Gorove put it: “an individual acting on his [or her] own behalf or on behalf of another individual or a private association or an international organization could lawfully appropriate any part of outer space, including the Moon and other celestial bodies.”<sup>40</sup> Perhaps it was this observation that catalyzed the COPUOS to develop the Moon Agreement.

This argument notwithstanding, no State Party to the Outer Space Treaty has indicated a preference to interpret Article II in this manner. Instead, debate remains over what actually constitutes national appropriation. The “sweeping language” of Article II could have been interpreted to apply both to areas as well as resources.<sup>41</sup> However, reference must be made once again to the Moon Agreement which clearly states that “[n]either the surface nor the subsurface of the Moon, *nor any part thereof or natural resources in place*, shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or of any natural person.”<sup>42</sup> It is deeply significant that the Outer Space Treaty does not include this language, suggesting that Article II does not apply to parts of celestial bodies, or the resources contained therein. In other words, Article II definitely could be interpreted to allow for the ownership of resources extracted from space, the Moon and other celestial bodies.

It is also worth noting again that each of the United States, China, Russia, and Japan have obtained material directly from the Moon or other extraterrestrial objects without objection by any

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<sup>38</sup> Universal Declaration of Human Rights, G.A. Res. 217A (Dec. 8, 1948).

<sup>39</sup> Outer Space Treaty, *supra* note 7, art. III.

<sup>40</sup> Gorove, *supra* note 19, at 352.

<sup>41</sup> Stephen Gorove, *Implications of International Space Law for Private Enterprise*, 7 ANNALS AIR & SPACE L. 319, 323 (1982).

<sup>42</sup> Moon Agreement, *supra* note 30, art. 11(3) (emphasis added).



other State Party to the Outer Space Treaty. This supports the interpretation that there are clearly instances in which the national non-appropriation principle does not apply, which may be, of course, when the object in question is not, in fact or in law, considered as falling within the category of “celestial bodies.”

## ii. By Any Other Means

There is also a question of what the concept of “by any other means” entails. This idea appears to conflict with other provisions of the Outer Space Treaty. Pursuant to Article VIII, objects left in space remain under the ownership and control of the State that put them there.<sup>43</sup> In fact, pursuant to Article VII of the Outer Space Treaty and Article III of the Liability Convention, States are “internationally liable” for damage caused to an object in space belonging to another State.<sup>44</sup> Yet leaving the objects *in situ*, or giving them wide berth in order to avoid liability, essentially results in perpetual occupation of the surface upon which they rest or the location they occupy. This notion could even be extended to locations that exist in an even more confounding state for legal and physical consideration, such as a Lagrange points, which possess a physical nature.<sup>45</sup> Given that any object sent to space would, by necessity, occupy or appropriate the physical space of the object itself, applying a prohibition on the appropriation of the space an object occupies by the fact of its existence would be an “absurd” interpretation of Article II.<sup>46</sup> However, this approach could certainly be argued to run afoul of the non-appropriation principle encapsulated in Article II and evidences the incompatibility of “appropriation in the broadest

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<sup>43</sup> Outer Space Treaty, *supra* note 7, art. VIII.

<sup>44</sup> *Id.* at art. VII. Liability Convention, *supra* note 28, art. III. To compound matters, under both the Outer Space Treaty and Liability Convention liability is not based on ownership of the object, but on a country’s status as a so-called “launching State.” Per the treaty regime, any one of four States may be considered a “launching State” for liability purposes: 1) the State which launches; 2) the State which procured the launch; 3) the State from whose territory the object was launched; and 4) the State from whose facility the object was launched. *Id.* at art. I.

<sup>45</sup> This is not idle conjecture, but present reality. The James Webb Telescope, for example, jointly operated by NASA, the European Space Agency, and the Canadian Space Agency, currently occupies the Lagrange point designated as L2.

<sup>46</sup> Timothy Justin Trapp, *Taking up Space by Any Other Means: Coming to Terms with the Nonappropriation Article of the Outer Space Treaty*, 2013 U. ILL. L. REV. 1681 1691 (2013).

sense of the word” and what the actual, practical, and preferable meaning of the term might be.<sup>47</sup> Additionally, while at one end of the spectrum, it is clear that the use or threat of force to exclude access to any part of space would be prohibited under the Outer Space Treaty,<sup>48</sup> merely stating that an act by or presence of an object does not constitute appropriation, such as is the case with the International Space Station,<sup>49</sup> cannot be deemed sufficient to resolve the matter.<sup>50</sup> Moreover, others have argued that private property rights are likewise proscribed by the OST in so far as the reasoning that holds that “if States cannot appropriate the extraterrestrial realms, then *a fortiori* neither can their nationals...and State endorsement of private appropriation would be a form of national appropriation.”<sup>51</sup> Therefore, whether by mere existence, location, national endorsement, or otherwise, “by any other means” lacks the clarity necessary to allow the term to be construed as to have any absolute governing effect to the terms of the Outer Space Treaty. Virgiliu Pop argues, in fact, that some of this lack of clarity can be resolved not by determining the scope and application of Article II of the OST to private persons in the context of property rights as such, but to the objects governed themselves.<sup>52</sup> This approach is an inspired starting point to resolve the ambiguity and confusion surrounding this issue, though it must be done in concert with a defined limitation and applied criteria on the extent to which any formulation is applied. Further, this postulation does not sufficiently take into account the acts and assertions of individual nations or advances in technology whether to date or into the future.

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<sup>47</sup> *Id.*

<sup>48</sup> *Id.* at 1698; see also Leslie I. Tennen, *Towards A New Regime for Exploitation of Outer Space Mineral Resources*, 88. NEB. L. REV. 794, 804 (2010).

<sup>49</sup> See e.g., Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station, Jan. 29, 1998, T.I.A.S. No. 12927, Art. 2 (noting, “(2) Nothing in this Agreement shall be interpreted as ... (c) constituting a basis for asserting a claim to national appropriation over outer space or over any portion of outer space.”).

<sup>50</sup> Trapp, *supra* note 46, at 1700.

<sup>51</sup> VIRGILIU POP, WHO OWNS THE MOON? 12 (2009).

<sup>52</sup> *Id.* at 48.

C. *What is Outer Space and How Far do Earth's Laws Extend?*

In addition to considering what is or is not a “celestial body” we must also consider to what extent we might apply this term when finally agreed. The vastness of space is, potentially, infinite,<sup>53</sup> and we must contemplate the limits of, or distinctions between different areas of space as we consider defining terms such as “celestial bodies” and the broader development and application of space law in general. Should we determine where space begins,<sup>54</sup> and simply apply the agreed terms, quite possibly, *ad infinitum* (and *ad absurdum*), in turn coining a new legal maxim of *lex terre est sine fine in universo* (the law of the Earth is without end in the universe)? Or should we adopt the proposed construct of distinct regions of space such as “solar space” (which itself could be subject to debate as scientists and lawyers argue in favor of or against marking the edge of our Solar System as the Oort Cloud, the Termination Shock, or Heliopause),<sup>55</sup> “galactic space” (the entirety of our Milky Way Galaxy outside of the Solar System), and “extragalactic space” (the rest of the universe beyond the Milky Way)?<sup>56</sup> The question should also be asked: where does the Outer Space Treaty’s jurisdiction end? This question affects the debate and our understanding of

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<sup>53</sup> Jonathan Gordon & Nola Tillman, *How Big is the Universe?*, SPACE.COM (Jan. 28, 2022), <https://www.space.com/24073-how-big-is-the-universe.html>; See also DOUGLAS ADAMS, *THE HITCHHIKER’S GUIDE TO THE UNIVERSE*, N.Y. Harmony Books (1980).

<sup>54</sup> Numerous proposals have been offered to define the limits of air space, and thus the beginning of outer space. A widely accepted notion for the edge of space is the “Von Kármán Line,” which defines space as beginning 100 kilometers (54 nautical miles; 62 miles; 330,000 feet) above Earth’s mean sea level. See Rodney W. Johnson, *Problems of Law and Public Order in Space*, 52 A.B.A.J. 555, 556 (1966). Controversy exists, however, and science continues to challenge the notion of the edge of space; as such, various alternative proposals have been put forth, which often define the lower limits of outer space as being closer to the surface of the Earth. See Eric Betz, *The Kármán Line: Where Does Space Begin?*, ASTRONOMY (Mar. 5, 2021), <https://www.astronomy.com/space-exploration/the-karman-line-where-does-space-begin/> (noting that the actual boundary between Earth and space could lie anywhere between 30 kilometers (18.5 miles) above the surface to more than a 1.6 million km (over a million miles) away).

<sup>55</sup> Daniel B. Reisenfeld, *A Three-dimensional Map of the Heliosphere from IBEX*, 254 ASTROPHYSICAL J., SUPP. SER. 40 (2021); see also Jamie Carter, *The Edge Of Our Solar System Has Been Found: ‘Bat-Sense’ Used To Find ‘Bubble’ All Around Us*, FORBES (June 18, 2021), <https://www.forbes.com/sites/jamiecartereurope/2021/06/18/the-edge-of-our-solar-system-has-been-found-the-heliosphere-bubble-just-got-mapped/>.

<sup>56</sup> John C. Hogan, *Legal Terminology for the Upper Regions of the Atmosphere and for the Space Beyond the Atmosphere*, 51 AM. J. OF INT’L L. 362 (1957); E. Weinmann & H.C. MacDougall, *The Law of Space*, 35 FOREIGN SERV. J., 22-26 (1958).

whether any physical object or phenomena falls within the meaning and prohibitions prescribed by Article II of the Outer Space Treaty.

According to Pop, considering whether a “celestial body” is a legal “thing” requires the application of common sense and the reasonable person standard, and terrestrial *corpus juris spatialis*, should be restricted to our solar system:

Recently, astronomers have discovered quasars more than 10 billion light years away, the farthest objects ever seen in space. These may be objects in the astronomical sense; we would however submit that they are not objects in the legal sense. Neither should nebulae, black holes, stars other than our Sun, or extra-solar planets, be considered as falling under the sway of *corpus juris spatialis*. While the Outer Space Treaty does not impose on itself any territorial limits, it would be unreasonable to extend terrestrial law to the scale of the universe.<sup>57</sup>

This author could not agree more. Moreover, while not widely ratified, and explicitly rejected by US presidential executive order, the Moon Treaty does provide evidence that limiting the applicability of space law of terrestrial origin has not been only contemplated but attempted. Consider Pop again:

The Moon Treaty, despite its poor record of ratification, does contain a reasonable limit, its provisions applying “...to other celestial bodies within the solar system, other than the Earth...” (Article 1.1.). It is thus submitted by us that the legal notion of “thing” does not have any validity beyond our solar system.<sup>58</sup>

It should be noted that there is no agreed standard defining where national or international air space stops and outer space begins.<sup>59</sup> As such, determining exactly when the application of the Outer Space Treaty’s provision begins is difficult. As noted, however, even more difficult would be considering the outer limits of the application of the Outer Space Treaty. At the boundary between air space and outer space, wherever that is determined to be, there

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<sup>57</sup> POP, *supra* note 51, at 48.

<sup>58</sup> *Id.* at 48-49.

<sup>59</sup> Shadi A. Alshdaifat, *Who Owns What in Outer Space? Dilemmas Regarding the Common Heritage of Mankind*, PECS J. INT’L & EUR. L. 21 (2018).

is nothing recognizable or credibly claimed to be a “celestial body,” thus this ongoing debate does not frustrate our purposes here. The first, undeniably “celestial object” one encounters as we travel farther from the Earth is the Moon, so clearly and universally agreed to be a “celestial body” that it has been singled out for specific and more rigorous, though as yet unsuccessful, legal treatment. However, once past the Moon, Lagrange Points, other planets and dwarf planets, their respective satellites or companions, and the myriad other objects encountered within the solar system require legal definition. We may also need to consider those objects that regularly traverse the solar system, or which may enter it at some point and remain for a considerable period of time measured in geologic or galactic timescales. Surely, we cannot presume that the term “celestial body” applies to every speck of dust beyond Earth’s atmosphere AND that Earth’s authority extends throughout the entire Universe. The author would contend that, so far as seems reasonable, the Solar System would be the maximum extent of the applicability of the jurisdiction of the Outer Space Treaty.

We are also confronted with further complications as, even the authoritative International Astronomical Union (IAU) only applies the term “celestial body” to its definition of planets and “dwarf planet[s].”<sup>60</sup> IAU Resolution B5 provides the following definitions:

(1) A planet is a celestial body that (a) is in orbit around the Sun, (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and (c) has cleared the neighbourhood around its orbit.

(2) A “dwarf planet” is a celestial body that (a) is in orbit around the Sun, (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, (c) has not cleared the neighbourhood around its orbit, and (d) is not a satellite.

(3) All other objects, except satellites, orbiting the Sun shall be referred to collectively as “Small Solar System Bodies.”<sup>61</sup>

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<sup>61</sup> IAU Res. B5, (Aug. 24, 2006) 26<sup>th</sup> General Assembly IAU.

Resolution B5 goes on to enumerate the planets as Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Further, the IAU describes “Small Solar System Bodies” as “*most* of the Solar System asteroids, *most* Trans-Neptunian Objects (TNOs), comets, and other small bodies.”<sup>62</sup> Limiting the definition of “celestial bodies” to the objects identified and named by the IAU, however, would be far too restrictive and open the whole of the rest of the solar system to a legal void and a free-for-all by both sovereign States and private actors.

Further contradictions by such an authority as the IAU exist in abundance. On a webpage maintained by the IAU describing Pluto’s place within our solar system and the IAU categorization scheme, not even dwarf planets are described as “celestial bodies,” but rather, blandly, as “objects”<sup>63</sup> The IAU states that “[a] planet is a celestial body. . .”<sup>64</sup> and then further states, in the context of the preceding IAU definition, that, “[p]lutoids are celestial bodies,” and “[t]he two known and named plutoids are Pluto and Eris.”<sup>65</sup> The IAU makes clear that once size and characteristics of the objects themselves, along with their orbits and relationships to other objects in the Solar System (e.g., their orbital plane), begin to change they cease to be described as a “celestial body” and are simply referred to as “object[s].”<sup>66</sup> What’s more, the IAU describes planets and dwarf planets as being separate classes of “objects” and then explicitly goes on to call one of these categories “celestial objects.” The basic and long-established legal interpretation principle of *inclusio unius est exclusio alterius* leads only to one conclusion: the IAU maintains an extremely minimalist and strictly limited definition of what is and is not a “celestial body.” The IAU further, and troublingly, restricts those objects that may be considered “celestial bodies” for the purposes of interpreting the Outer Space Treaty, however, in that it does not count natural satellites of planets to be “celestial bodies” in their own rights.<sup>67</sup> The IAU rejects the notion

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<sup>62</sup> *Id.* (emphasis added).

<sup>63</sup> *Id.*

<sup>64</sup> *Id.*

<sup>65</sup> Pluto and the Developing Landscape of Our Solar System, INT’L ASTRONOMICAL UNION, <https://www.iau.org/public/themes/pluto/> (last visited Nov. 2, 2023)

<sup>66</sup> *Id.* (“Currently there are five objects accepted as dwarf planets. Ceres, Pluto, Eris, Makemake and Haumea.”).

<sup>67</sup> *Id.*

that natural satellites of the eight recognized planets can be considered Dwarf Planets themselves, which naturally precludes them from being Plutoids, Dwarf Planets, or “celestial bodies” as well.<sup>68</sup> The IAU specifically states that a “dwarf planet cannot be a satellite.”<sup>69</sup> However, taking the IAU’s explanation to its logical conclusion, the Moon would also not qualify as a “celestial body” within the scope of the OST under the IAU’s definition and clearly this could not have been the intent of the drafters of the OST or its State parties as the Treaty consistently references the “Moon and *other* celestial bodies.”<sup>70</sup> Therefore, we must consider the IAU listing and definitions to be helpful, but not definitive or exhaustive.<sup>71</sup> We should then turn to other sources to explore this question further and expand the contours of our understanding of what is practicable on this issue.

*D. Examples of National and International Interpretations of Article II*

i. The Artemis Accords

The Artemis Accords are a non-binding, “political commitment” intended to “increase the safety of operation, reduce uncertainty, and promote the sustainable and beneficial use of space for all humankind.”<sup>72</sup> The Artemis Accords reinforce existing international space law and reaffirm that space activities are to be undertaken for “peaceful purposes” and “in accordance with relevant international law.”<sup>73</sup> Specifically, the Artemis Accords emphasize astronaut assistance obligations from the Rescue Agreement<sup>74</sup> and registration requirements from the Registration Convention.<sup>75</sup> Additionally, the Artemis Accords seek transparency, interoperability,

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<sup>68</sup> *Id.*

<sup>69</sup> IAU Resolution B5, *supra* note 61.

<sup>70</sup> *See e.g.*, Outer Space Treaty, *supra* note 2, art. I. (emphasis added).

<sup>71</sup> One clear feature of the objects listed, “celestial” or otherwise, is that many of them are named, thus imputing an intangible value to them and their categories. By this we can understand that humanity feels greater affinity for the Moon or for Pluto, despite neither strictly qualifying as a “celestial object” according to the IAU, than we would for any mass comprising part of the asteroid belt or defined generally as a “meteor.”

<sup>72</sup> Artemis Accords, *supra* note 12, § 1.

<sup>73</sup> *Id.* § 3.

<sup>74</sup> *Id.* § 6. *See also* Rescue Agreement, *supra* note 27.

<sup>75</sup> *Id.* § 7. *See also* Registration Convention, *supra* note 29.

sharing of scientific findings, and mitigation against causing space debris.<sup>76</sup> Finally, and most importantly for our purposes here, the Artemis Accords aim to promote specific interpretations of the Outer Space Treaty concerning the extraction and utilization of space resources, affirming “that the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty.”<sup>77</sup> Clearly, the extraction of space resources must come from somewhere; without a more clearly defined meaning, that somewhere could inadvertently be a “celestial body.” Moreover, by its own terms, the Artemis Accords implicitly designates the Moon and Mars as “celestial bodies.” Section 9 of the Accords declares the intent of the signatories to “preserve outer space heritage, which they consider to comprise historically significant human or robotic landing sites, artifacts, spacecraft, and other evidence of activity on celestial bodies.”<sup>78</sup> As the Moon and Mars are currently the primary the locations on which “human or robotic landing sites” as well as any artifacts, spacecraft, and other evidence of activity” are to be found, they must, per the Artemis Accords, be “celestial bodies.”

As the Artemis Accords are open to any nation to join, and the list of those electing to do so continues growing, the Artemis Accords have the potential to achieve much in the way of establishing not only a broad range of acceptable standards of responsible behavior in outer space but to help resolve the many outstanding issues left unanswered by the Outer Space Treaty as well as emerging heretofore unknowns about extraterrestrial human activities.

ii. National Laws: United States, UAE, Luxembourg and Japan

*a. United States*

As noted above, the United States is party to four of the five space treaties. Rather than ratify the Moon Treaty, however, the United States pursued national legislation and policy declarations to supplement and interpret the Outer Space Treaty and the other broadly ratified space-related legal instruments. Beginning with

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<sup>76</sup> Artemis Accords, *supra* note 6, §§ 4, 5, 8 & 12.

<sup>77</sup> *Id.* § 10.

<sup>78</sup> *Id.* § 9.



the Space Resource Exploration and Utilization Act of 2015<sup>79</sup> (Space Resources Act), the United States recognized the right of private citizens to own and trade in natural resources obtained from an “asteroid resource or a space resource.”<sup>80</sup> Such legislative text appears to reflect the abovementioned notion distinguishing between restraints on national appropriation versus the permissibility of private appropriation. Moreover, the United States explicitly avoids the use of the term “celestial bodies” and identifies at least one category of “asteroid resources” that would seem to be separate and apart from the OST’s terminology. US space policy pronouncements also explicitly draw from Article II of the Outer Space Treaty in asserting that “[t]he United States will pursue the extraction and utilization of space resources in compliance with applicable law, recognizing those resources as critical for sustainable exploration, scientific discovery, and commercial operations.”<sup>81</sup> An executive order issued by then-President Trump declares that:

Americans should have the right to engage in commercial exploration, recovery, and use of resources in outer space, consistent with applicable law. *Outer space is a legally and physically unique domain of human activity*, and the United States does not view it as a global commons. Accordingly, it shall be the policy of the United States to encourage international support for the public and private recovery and use of resources in outer space, consistent with applicable law.<sup>82</sup>

Finally, it is noteworthy that the United States was one of the original authors of the Artemis Accords. Taken together, it would appear there are ample grounds to argue that the United States recognizes the broad interpretation of Article II of the Outer Space Treaty for certain appropriation of celestial bodies, particularly when these activities are private in nature.

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<sup>79</sup> Space Resource Exploration and Utilization Act of 2015, Pub. L. No. 114-90, 129 Stat. 720, 721 (2015) (codified as amended at 51 USC. § 51302(b) (2012)).

<sup>80</sup> *Id.*

<sup>81</sup> NAT’L SPACE POL’Y OF THE UNITED STATES OF AMERICA (2020), <https://trumpwhitehouse.archives.gov/wp-content/uploads/2020/12/National-Space-Policy.pdf>.

<sup>82</sup> Exec. Order No. 13914, 85 Fed. Reg. 20381 (Apr. 6, 2020)(emphasis added).

*b. UAE*

The United Arab Emirates (UAE) is an active and relative newcomer to space policy and law. UAE only established its national space agency in 2014 under the authority of Decree No. 1 of 2014.<sup>83</sup> The UAE Space Agency swiftly established a bold program, launching *The Hope* orbiter on July 19, 2020, which entered orbit around Mars on February 9, 2021.<sup>84</sup> The UAE Space Agency, however, has ambitions to establish what it expects to be the first permanent human settlement on the Red Planet by 2117.<sup>85</sup> To achieve this success and attain its longer-term goals, the UAE partners with other national space programs, such as those in the United States,<sup>86</sup> Japan,<sup>87</sup> and India,<sup>88</sup> as well as the private sector. To support its rapid entry into the community of space nations, the UAE has worked swiftly to establish national space legislation and a national space policy. The space sector in the UAE is governed by Federal Law No. 46 of 2023 on the Regulation of the Space Sector.<sup>89</sup> The legislation addresses space activities such as (i) launch, re-entry, and removal or disposal of space objects from orbit; (ii) the operation of space objects and satellite communication activities; (iii) the provision of logistical support services in outer space; (iv) the management of space data activities; and (v) the collection or trade of meteorites that land in the territory of the UAE.<sup>90</sup>

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<sup>83</sup> *Space Regulatory Authorities*, Gov't of the U.A.E. (Oct. 30, 2023), <https://u.ae/en/about-the-uae/science-and-technology/key-sectors-in-science-and-technology/space-science-and-technology/space-regulatory-authorities>.

<sup>84</sup> Jonathan Amos, *Emirates Mars Mission: Hope Spacecraft Enters Orbit*, BBC (Feb. 9, 2021), <https://www.bbc.com/news/science-environment-55998848>.

<sup>85</sup> Leonard David, *United Arab Emirates Wants to Build a City on Mars*, SPACE.COM (2017), <https://www.space.com/35817-uae-city-on-mars-2117-project.html>.

<sup>86</sup> See Stephen Clark, *United Arab Emirates Successfully Sends Its First Mission Toward Mars*, SPACEFLIGHT NOW (July 19, 2020), <https://spaceflightnow.com/2020/07/19/united-arab-emirates-successfully-sends-its-first-mission-toward-mars/>.

<sup>87</sup> Kenneth Chang, *From Dubai to Mars, With Stops in Colorado and Japan*, N.Y. TIMES (Feb. 15, 2020), <https://www.nytimes.com/2020/02/15/science/mars-united-arab-emirates.html>.

<sup>88</sup> Monit Khanna, *How ISRO Contributed to Success of UAE's Hope Probe Mars Mission*, INDIA TIMES (Feb. 10, 2021), <https://www.indiatimes.com/technology/news/isro-success-uae-hope-mars-mission-533956.html>.

<sup>89</sup> Federal Law No. (46) of 2023, Concerning the Regulation of the Space Sector, <https://uaelegislation.gov.ae/en/legislations/2129/download>.

<sup>90</sup> *Id.* at arts. 4 & 18.

The more interesting aspect is the UAE's stated aim to utilize this legislation to achieve the objectives of the UAE's National Space Policy, in addition to, *inter alia*, "[s]timulate investment and encourage private and academic sector participation in the Space Sector and related activities."<sup>91</sup> Additionally, the UAE views its legislation as supporting the nation's commitment to implement the provisions of international conventions and treaties related to outer space.<sup>92</sup> The UAE is a party to the Outer Space Treaty, and it should be noted that, as a signatory to the Artemis Accords, the UAE is implicitly affirming that the Artemis Accords comply with these international conventions and treaties related to outer space. Moreover, UAE's federal law contemplates space resources exploration or extraction activities<sup>93</sup> for exploitation and use for scientific, commercial or other purposes.<sup>94</sup> Thus UAE appears not to deem all objects within the solar system or generally in outer space as "celestial bodies" under the terms of the OST.

### *c. Luxembourg*

Luxembourg has also already undertaken steps to address several aspects of commercial space activities.<sup>95</sup> Luxembourg's Space Agency is a component of the country's Ministry of Economy, which published Luxembourg's National Action Plan for Space and Technology 2020 – 2024.<sup>96</sup> Luxembourg's space policy and legal framework reflect the nation's understanding that "[i]nternational space treaties remain untested regarding who would own the rights to minerals, gases, and water found in outer space."<sup>97</sup> To resolve this state of affairs, in 2017, Luxembourg adopted a legal and regulatory space law framework (2017 Luxembourg Space Law) that "ensures

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<sup>91</sup> *Id.* at art. 2(2).

<sup>92</sup> *Id.* at art. 2(4).

<sup>93</sup> *Id.* at art. 8. *See also* Ministry of Cabinet Affairs Resolution No (19) of 2023 Regarding Space Resources. Copies of UAE Space Regulations can be found here: <https://space.gov.ae/en/policy-and-regulations>.

<sup>94</sup> *Id.*

<sup>95</sup> *Space Policy and Strategy*, LUXEMBOURG SPACE AGENCY (Sept. 23, 2019), <https://space-agency.public.lu/en/agency/mission-vision.html>.

<sup>96</sup> *National Action Plan, Space Science and Technology 2020-2024*, Luxembourg Space Agency, (2020), <https://space-agency.public.lu/dam-assets/publications/2020/Luxembourg-space-action-plan-ENG-final-kw.pdf>

<sup>97</sup> *Legal Framework, Law on Space Resources*, LUXEMBOURG SPACE AGENCY (Mar. 2, 2022). <https://space-agency.public.lu/en/agency/legal-framework.html>.

stability and guarantees a high level of protection for investors, explorers, and miners.”<sup>98</sup> Luxembourg is clear to note, however, that the 2017 Luxembourg Space Law “does not have an objective, purpose or effect of paving the way for any national appropriation of outer space, including the Moon and other celestial bodies themselves,” but, rather, seeks to ensure “that private operators can be confident about their rights [to] resources they extract in space.”<sup>99</sup> Here, Luxembourg employs the term “celestial bodies” without giving any meaning to the term while simultaneously recognizing the “untested” nature of the treaties from which this term is derived. Moreover, Luxembourg also distinguishes between prohibited actions by nations under Article II of the OST and explicit legal protection for similar activities carried out by “private operators.” Like the UAE, Luxembourg is also a party to the Artemis Accords and has ratified the Outer Space Treaty, providing further support for the notion that not only do the Artemis Accords comply with extant international treaties but that private extraction and use of space resources is permissible under the current legal structure.

#### *d. Japan*

As noted above, Japan is another significant spacefaring nation which has undertaken impressive feats warranting the analysis of this article. Japan’s space history and policy stretch back a bit further than that of Luxembourg or the UAE. In fact, just two years after becoming one of the original parties to the Outer Space Treaty, the lower house of Japan’s national legislature adopted a resolution stating that “[t]he development and use of objects that can be launched into space beyond the main part of the earth’s atmosphere and rockets for launching such objects...shall be limited to the purposes of peace...”<sup>100</sup> Over several years, Japan’s space policy, space law<sup>101</sup> and space capabilities have evolved, culminating in the

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<sup>98</sup> *Loi du 20 juillet 2017 sur l’exploration et l’utilisation des ressources de l’espace*, Journal Officiel du Grand Luxembourg (July 20, 2017), <https://data.legilux.public.lu/file/eli-etat-leg-loi-2017-07-20-a674-jo-fr-pdf.pdf>.

<sup>99</sup> IAU Res. B5, *supra* note 6161.

<sup>100</sup> *Resolution on the Basics of Space Development and Utilization in Japan*, Plenary Session of the House of Representatives, May 9, 1969, [http://www.clearing.mod.go.jp/hakusho\\_data/1988/w1988\\_9119.html](http://www.clearing.mod.go.jp/hakusho_data/1988/w1988_9119.html).

<sup>101</sup> *Basic Space Law*, Japan 169th Diet, Law No. 43 (May 28, 2002). [https://www.shugiin.go.jp/internet/itdb\\_housei.nsf/html/housei/16920080528043.htm](https://www.shugiin.go.jp/internet/itdb_housei.nsf/html/housei/16920080528043.htm).

consolidation of Japan's Institute of Space and Astronautical Science (ISAS), the National Aerospace Laboratory of Japan (NAL), and National Space Development Agency of Japan (NASDA) into The Japan Aerospace Exploration Agency (JAXA) in 2003. As described previously, JAXA has already engaged in activities that could be deemed extraction, or exploitation and use, of at least part of a "celestial body." However, Japan has thus far not engaged in any actions to which any parties to the Outer Space Treaty have objected. Japan is also a party to the Artemis Accords, further entrenching the notion that State Parties to the Outer Space treaty do not view the Artemis Accords or their individual space activities as violative of international treaties or law. The Artemis Accords feature quite prominently in Japan's latest national space policy,<sup>102</sup> and clearly, Japan believes its capture of scientific samples does not violate the Outer Space Treaty, although its asteroid missions could easily be cast as "national appropriation...by means of use...or by any other means."<sup>103</sup> Therefore, the only reasonable conclusion one could draw from Japan's space activities and the (non) reaction of other nations is the fact that they do not view the objects from which Japan drew samples as "celestial bodies" under the Outer Space Treaty.

### III. WHAT IS OR WHAT SHOULD BE A "CELESTIAL BODY?"

As noted, we cannot employ a single term, "celestial bodies," to refer to all matter in the universe or even just the solar system. Moreover, authorities as esteemed as the IAU have differing and, at times, contradictory uses of that term. N. Jasentuliyana and Roy S.K. Lee concisely articulate the surprising generality attributed to the Moon in the OST and to "celestial bodies" generally:

The Moon and other celestial bodies come under the scope of application of the Treaty. It was perhaps presumptuous and inappropriate to consider in one single instrument such separate elements as outer space (which is not a *res* but an infinite ocean of ether), the Moon (only natural satellite of earth) and other celestial bodies (which represent finite and microcosmic

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<sup>102</sup> Outline of the Basic Plan on Space Policy, Gov't of Japan, (June 30, 2020), [https://www8.cao.go.jp/space/english/basicplan/2020/abstract\\_0825.pdf](https://www8.cao.go.jp/space/english/basicplan/2020/abstract_0825.pdf).

<sup>103</sup> Outer Space Treaty, *supra* note 7, art. II.

entities). It was also surprising that the Moon and all the other celestial bodies were considered together ...<sup>104</sup>

### A. *Humanity's Evolving Understanding of the Cosmos and Celestial Bodies*

For eons, humans have gazed at the night sky and experienced a personal, spiritual or religious connection to certain celestial objects in our solar system. However, before the 17th century, “the known solar system consisted of six planets.”<sup>105</sup> The 17th Century witnessed the discovery of several moons in orbit around Jupiter<sup>106</sup> and Saturn,<sup>107</sup> and in the 18th Century, humanity added Uranus<sup>108</sup> to its catalog of named solar system objects along with two named satellites each for Uranus<sup>109</sup> and Saturn.<sup>110</sup> During the 19th

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<sup>104</sup> N. JASENTULIYANA & ROY S.K. LEE, MANUAL ON SPACE LAW 253 (1979).

<sup>105</sup> John Uri, *240 Years Ago: Astronomer William Herschel Identifies Uranus as the Seventh Planet*, NASA (Mar. 15, 2021), <https://www.nasa.gov/history/240-years-ago-astronomer-william-herschel-identifies-uranus-as-the-seventh-planet/>.

<sup>106</sup>

Peering through his newly-improved 20-power homemade telescope at the planet Jupiter on Jan. 7, 1610, Italian astronomer Galileo Galilei noticed three other points of light near the planet, at first believing them to be distant stars. Observing them over several nights, he noted that they appeared to move in the wrong direction with regard to the background stars and they remained in Jupiter's proximity but changed their positions relative to one another. He later observed a fourth star near the planet with the same unusual behavior. By Jan. 15, Galileo correctly concluded that they were not stars at all but moons orbiting around Jupiter, providing strong evidence for the Copernican theory that most celestial objects did not revolve around the Earth.

John Uri, *410 Years Ago: Galileo Discover's Jupiter's Moons*, NAT'L AERONAUTICS AND SPACE ADMIN (Jan. 9, 2020), <https://www.nasa.gov/history/410-years-ago-galileo-discovers-jupiters-moons/>.

<sup>107</sup> “Titan, Saturn's largest moon...was observed by Christiaan Huygens in 1655 . . . Between 1671 and 1684, Giovanni Domenico Cassini discovered the moons of Tethys, Dione, Rhea and Iapetus – which he collectively named the ‘Sider Lodoicea’ (Latin for ‘Louisian Stars,’ after King Louis XIV of France). Matt Williams, *The Moons of Saturn*, PHYS.ORG (Sept. 14, 2015) <https://phys.org/news/2015-09-moons-saturn.html>.

<sup>108</sup> William Herschel discovered Uranus on March 13, 1781. Uri, *supra* note 105.

<sup>109</sup> “Herschel later discovered Uranus' two largest moons, Titania and Oberon, in 1787.” *Id.*

<sup>110</sup> “In 1789, William Herschel discovered Mimas and Enceladus,” both moons of Saturn. Williams, *supra* note 107.

Century, Ceres<sup>111</sup> and Neptune<sup>112</sup> joined this growing list of “celestial bodies” along with moons orbiting Saturn, Jupiter, Mars, Uranus and Neptune.<sup>113</sup>

It was not until the 20th Century that the human race came to know of Pluto and expanded its count of moons orbiting Jupiter, Saturn, Uranus, and Neptune.<sup>114</sup> While a portion of humanity expressed dismay at Pluto’s reclassification as a “Dwarf Planet,”<sup>115</sup> much of the human race identifies and feels attachment to a small handful of items, which are invariably named. At the same time, however, some named objects may only be a “pile of rubble.”<sup>116</sup> We should consider whether there are named and enumerable objects that hold a special place in the hearts and minds of humanity, regardless of their location or physical properties, that would make them not only “celestial bodies” for the purposes of the OST but part of the Common Heritage of Humanity.

To speak of a Common Heritage of Humanity in space as an element of defining “celestial bodies,” we may wish to determine what exactly that Common Heritage is by also considering the relative cultural—or even emotional—value humanity applies to any and all objects of any mass within the solar system.

Undoubtedly, all would agree that Earth’s Moon, the named planets, and many of the natural satellites of the solar system, as well as several other named objects, should be counted as “celestial bodies.” Reasonable people could differ, however, on the exact

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<sup>111</sup> *Ceres Facts*, NAT’L AERONAUTICS AND SPACE ADMIN, <https://science.nasa.gov/dwarf-planets/ceres/facts/> (last visited Sep. 15, 2023), Of significant relevance to this discussion, and our understanding of the fluidity of the terminology used to describe individual “celestial bodies,” we must note that Ceres was originally categorized as a planet, then as an asteroid, and then as a Dwarf Planet alongside Pluto. Moreover, while the IAU currently recognizes just five Dwarf Planets, debate on this point, and of the very use of the term “Dwarf Planet,” rages. *See generally, Pluto and the Developing Landscape of Our Solar System*, INT’L ASTRONOMICAL UNION, <https://www.iau.org/public/themes/pluto/> (last visited Sept. 15, 2023).

<sup>112</sup> John Uri, *175 Years Ago: Astronomers Discover Neptune, the Eighth Planet*, NAT’L AERONAUTICS AND SPACE ADMIN. (Sept. 22, 2021), <https://www.nasa.gov/history/175-years-ago-astronomers-discover-neptune-the-eighth-planet/>.

<sup>113</sup> *See Planet and Satellite Names and Discoveries*, U.S. GEOLOGICAL SURVEY, <https://planetarynames.wr.usgs.gov/Page/Planets> (last visited Sept. 15, 2023).

<sup>114</sup> *Id.*

<sup>115</sup> Brian Resnick, *The Debate Over Pluto Will Never Die. Here’s the Latest Argument for Why It’s a Planet*, VOX (May 7, 2018).

<sup>116</sup> *See Anderson, supra note 3.*

boundaries of this list—do we include Pluto’s binary companion Cheron and its moons Styx, Nix, Kerberos and Hydra? What about the other Dwarf Planets identified by the IAU or the asteroids visited by Japan and the United States? Most people considering this issue could agree that humanity as a whole would not know, care or be affected in any way if, for example, most asteroids or Kuiper Belt Objects were excluded from the list of “celestial bodies” whether named or not. Further, would human beings care if, at some far-distant future point in time, the solar system event ceased to have an asteroid belt due to mining and other human activities?

Excellent scholarship has been produced regarding the legal status of “celestial bodies,”<sup>117</sup> while others have explored the question of mining in space in the context of international, domestic, and national legal regimes.<sup>118</sup> Still, others have examined the general landscape of current space law and the perceived gaps therein.<sup>119</sup> However, none of the literature has or proposes a concrete definition or mechanism to define “celestial bodies.”

The term “celestial” derives from the late 14th century:

pertaining to the sky or the visible heavens; pertaining to the Christian or pagan heaven," from Old French *celestial* "celestial, heavenly, sky-blue," from Latin *caelestis* "heavenly, pertaining to the sky," from *caelum* "heaven, sky; abode of the gods; climate," which is of uncertain origin; perhaps from PIE *\*kaid-slo-*, perhaps from a root also found in Germanic and Baltic meaning "bright, clear" (compare Lithuanian *skaidrus* "shining, clear;" Old English *hador*, German *heiter* "clear, shining, cloudless," Old Norse *heið* "clear sky").<sup>120</sup>

“Body” has Old English roots from *bodig*, meaning “the whole physical structure of a human or animal; material frame, material existence of a human; main or principal part of anything . . . The

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<sup>117</sup> See Michel Smirnoff, *Legal Status of Celestial Bodies*, 28 J. AIR L. & COM. 385, 388 (1962).

<sup>118</sup> See generally Laura C. Byrd, *Soft Law in Space: A Legal Framework for Extraterrestrial Mining*, 71 EMORY L. J. 801 (2022).

<sup>119</sup> See generally Katherine Latimer Martinez, *Lost in Space: An Exploration of the Current Gaps in Space Law*, 11 SEATTLE J. TECH., ENV'T. & INNOVATION L., 4 (2021), <https://digitalcommons.law.seattleu.edu/cgi/viewcontent.cgi?article=1022&context=sjteil>.

<sup>120</sup> *Celestial*, ONLINE ETYMOLOGY DICTIONARY, <https://www.etymonline.com/word/celestial> (last visited Sept. 15, 2023).



word was transferred to matter generally in Middle English (as in *heavenly body*, late 14c.).<sup>121</sup>

However, as a practical matter, and as our understanding of the cosmos grows and discoveries even beyond our solar system expand at a dizzying pace, what is or is not a “celestial body” has not been definitively determined. The Czech scholar Vladimir Mandl first introduced the term “celestial body” to the lexicon of space law in 1932,<sup>122</sup> and it appeared at the United Nations via a General Assembly resolution in December 1961.<sup>123</sup>

As noted previously, the IAU itself has certain categories of defined objects. These include, *inter alia*, Major Planets and the Moon, Dwarf Planets, Satellites of Planets in the Solar System, Minor Planets, Meteor Showers, and Comets. It should be noted that the IAU, either by implicit comparison or otherwise explicitly, provides reasonably clear definitions for these enumerated objects.<sup>124</sup> However, while the term “celestial body” is used by the IAU, nowhere is the term itself defined, and the IAU actually established, via Resolution B5, only three broad categories: Planets, Dwarf Planets, and All Other Objects.<sup>125</sup> Interestingly, for our purposes here, and at the risk of being repetitive, IAU Resolution B5 specifically states that a Planet or Dwarf Planet is a “celestial body” while omitting this term from “All Other Objects.”<sup>126</sup> More challenging still is the fact that even where others have attempted to define “celestial bodies” beyond mere scientific terminology, the distinctions have been couched in notions of technical capabilities, which is itself ever-changing.<sup>127</sup>

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<sup>121</sup> *Body*, ONLINE ETYMOLOGY DICTIONARY, <https://www.etymonline.com/search?q=body> (last visited Sept. 15, 2023).

<sup>122</sup> VLADIMIR MANDL, *DAS WELTRAUM-RECHT. EIN PROBLEM DER RAUMFAHRT* (1932); see also Ernst Fasan, *Asteroids and Other Celestial Bodies—Some Legal Differences*, 26 J. Space L. 33, 33 (1998).

<sup>123</sup> G.A. Res. 1721 (XVI), (Dec. 20, 1961).

<sup>124</sup> *Naming of Astronomical Objects*, INT’L ASTRONOMICAL UNION, <https://www.iau.org/public/themes/naming/#planetaryfeatures> (last visited Nov 16, 2023).

<sup>125</sup> IAU Res. GA26-B5, [https://www.iau.org/static/resolutions/Resolution\\_GA26-5-6.pdf](https://www.iau.org/static/resolutions/Resolution_GA26-5-6.pdf).

<sup>126</sup> *Id.*

<sup>127</sup> Irmgard Marboe & Michael Friedl, *What Are Space Resources: What Are Celestial Bodies - The Need for Refined Legal Definitions in view of Recent Regulatory Efforts Concerning Space Resources*, in 61 PROC. INT’L INST. SPACE L. 749 (2018) (citing a March 15, 1964) Draft Resolution out of Working Group Three of the International Institute of

One should note that these definitions are of recent provenance and could change again in the future. As recently as August 2006, the IAU downgraded the status of Pluto to that of a “dwarf planet” from its previous inclusion as one of the “nine planets around the sun.”<sup>128</sup> This means that, for now, only the inner Solar System’s rocky worlds and the outer system’s gas giants will be designated planets. However, many people alive still count Pluto amongst the planets or at least identify it as a named object, or “celestial body,” they can identify, which elevates its status in the minds of much of humanity even if its designation has been reduced.<sup>129</sup> Certainly, the idea of any individual or entity taking possession of Pluto or exploiting the planet to the point it is unrecognizable or non-existent would be viewed as a violation of both law and common decency, even though it would likely have little to no bearing on the lives of anyone living today or for the foreseeable future.

*B. Theories on the Question of What Is a “Celestial Body”*

i. Defining and Using the Province of all Humankind or Common Heritage Principle

The principle of the “Common Heritage of Humanity” emerged at a time of dramatic social, economic, cultural, and political change around the globe—when decolonization was accelerating, and the Cold War was intensifying. Applied directly to the Outer Space Treaty, one of the founders of space law, Argentinian Ambassador, professor, and lawyer Aldo Cocca stated that “the international community [has] endowed that new subject of international law—[humanity]—with the vastest common property (*res communis humanitatis*) which the human mind could at present conceive of, namely outer space itself, including the Moon and the other *celestial bodies*.”<sup>130</sup> Here is another example of a term used, without any

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Space Law (IISL), subsequently referred to by Aldo Armando Cocca, *Legal Status of Celestial Bodies and Economic Status of the Celestial Products*, in 7 PROC. INT’L INST. SPACE L. 15, 16 (1964); see also Fasan, *supra* note 122, at 36.

<sup>128</sup> DAVE MATTHEWS BAND, *Typical Situation*, on UNDER THE TABLE DREAMING (RCA 1994).

<sup>129</sup> See e.g., Resnick, *supra* note 115.

<sup>130</sup> Comm. On the Peaceful Uses of Outer Space, Summary Records of the Legal Subcomm. On its 6th Sess., at 7-8, UN Doc. A/AC.105/C.2/SR.75 (June 19, 1967) (emphasis

defined meaning or limitation. Moreover, “outer space” itself is not defined and could not and should not, in this author’s view, be reasonably considered to be the entirety of the universe as explained above. So, is all matter in the universe to be considered a “celestial body” and thus somehow protected as common heritage?” Clearly this cannot be. Nor should every object within our solar system. Space, writ large, cannot be deemed the Common Heritage of Humanity nor the Province of all Humankind.<sup>131</sup> However, perhaps select, explicitly enumerated and named objects within our solar system can and should be, excluding all else. One could imagine, for example, a time when comets would be freely harvested for their water ice, and other resources without objection, while humanity finds itself acutely protective of Haley’s Comet or Saturn’s Rings as part of the “common heritage of humanity.”

The common heritage of humanity or the common heritage principle likewise is a principle of international law that holds that defined territory and elements of humanity’s common heritage—cultural and natural—should be held in trust for future generations and be protected from exploitation by nations, entities, or even individuals.<sup>132</sup> As we can see from the language of the Artemis Accords, it may be that Neil Armstrong’s footprint on the Moon and the *Curiosity* rover on Mars would be considered “historically significant human or robotic landing sites,”<sup>133</sup> while the detritus resulting from crashed rocket stages or failed landers may not be considered worthy of such veneration and preservation. The recently concluded agreement between the United States and Japan makes a similar effort to protect “Lunar Sites of Historical or Scientific Value,”<sup>134</sup> which would likely include Armstrong’s historic footprint, but not necessarily some of the “junk” remaining on the lunar

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added). See Rudiger Wolfrum, *The Principle of the Common Heritage of Mankind*, 43 *Zeitschrift für Ausländisches Öffentliches Recht Und Völkerrecht* 312, 312 n.1; Aldo Amando Cocca, *The Advances in International Law Through the Law of Outer Space*, 9 *J. SPACE L.* 13, 14-15 (1981) (referring to this statement made in 1967).

<sup>131</sup> See Outer Space Treaty, *supra* note 7, art. I. In the event we encounter sentient alien civilizations, of whatever level of technological advancement, they may also scoff at the idea that Space itself or all the objects therein are somehow the Common Heritage, Province, or possession, of any other race in the cosmos.

<sup>132</sup> Alshdaifat, *supra* note 59, at 2, n.4.

<sup>133</sup> Artemis Accords, *supra* note 12, § 9.

<sup>134</sup> Press Statement, Antony J. Blinken, U.S. Secretary of State, The United States and Japan Sign Framework Agreement on Space Cooperation (Jan. 13, 2023).

surface such as a television camera lens or a urine collection assembly.<sup>135</sup> The author, however, readily concedes that these early space exploration items may all be revered for their historical and archeological value someday. It is, therefore, entirely possible that humanity will come to see nearly identical objects as having separate value for preservation as part of a shared province of humankind and thus deemed worthy of distinct classification, and this could apply to space objects such as asteroids or comets.

It should be noted that the issue of the Common Heritage Principal as applied to space is far broader than this article's consideration. In fact, it is a two-way street with terrestrial implications as well. When considering which objects humanity may deem worthy of preservation as part of our common heritage or as celestial objects, we must also consider a wider range of space activities, including those that impact our engagement with and appreciation of the cosmos from *terra firma*. Many indigenous peoples around the world, for example, embrace vast astronomical knowledge and intimacy in their traditions and cultures.<sup>136</sup> Human activity in on Earth and in outer space can affect terrestrial visibility of the cosmos and thus the opportunity for these communities to engage with celestial objects as they have done so for generations due to ground-based, and increasingly orbital, light pollution and other interference. Beyond the impact on indigenous communities, professional and amateur astronomers, as well as tourists, are also impacted.<sup>137</sup> To this end, the DarkSky International strives to combat light pollution and designates "Dark Sky" locations around the globe, such as the Mitzpe Ramon Crater in Israel, that benefit all peoples.<sup>138</sup>

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<sup>135</sup> Catalogue of Manmade Material on the Moon, NASA (Jul. 5, 2012), <https://history.nasa.gov/FINAL%20Catalogue%20of%20Manmade%20Material%20on%20the%20Moon.pdf>.

<sup>136</sup> See generally Karolina M. Zielinsak-Dabkowska and Kyra Xavia, *Looking Up to the Stars. A Call for Action to Save New Zealand's Dark Skies for Future Generations to Come*, 13 SUSTAINABILITY 13472 (2021).

<sup>137</sup> For more information, visit the DarkSky International website at <https://darksky.org/>.

<sup>138</sup> Editorial Staff, *Ramon Crater Named First International Dark Sky Place in the Mideast*, DARKSKY (Sept. 14, 2017), <https://www.darksky.org/ramon-crater-named-first-international-dark-sky-place-in-the-mideast/>.

## ii. Terrestrial Analogs

As has been noted, the concept that we must establish a legal status for “celestial bodies” is not new and enjoys various treatments and approaches. Some schools of thought draw on the Law of the Sea, The Antarctic Treaty, the concept of *res nullius*, *res communis omnium*, as well as numerous intermediate or hybrid combinations of the same.<sup>139</sup> Thus, while the term itself has not been defined, the *need* to define it is recognized and well-established.<sup>140</sup>

Arguments have been made that the legal construct attaining to outer space is unique and separate from any terrestrial law and that, specifically, the laws of the Earth derive from the facts and conditions of the Earth and, therefore, space law will derive from the facts and conditions of space.<sup>141</sup> While the author not only concedes but embraces the unique, emerging and evolving nature of space law, there are certain corollaries that can be invoked, and the two are not so separate. For example, while nobody would credibly argue that any entity could claim ownership and exclusive use of the Jovian satellite Europa, just as one would not claim that any individual could seek to claim ownership or exclusive use of all the sand on a public beach, so too would no individual or group of individuals argue that a child could not collect some seashells on that same beach nor that a scientist could not collect samples of the ice and subsurface ocean of Europa. But where is the limit, and to what degree would such a limit inform our understanding and ability to define “celestial body?”

Each of the asteroids targeted by Japan and the United States for sample-return missions range in size from 330 meters to 1 kilometer in diameter, and each has names (162173 Ryugu, 25143 Itokawa, and 101955 Bennu), so limiting “celestial bodies” based on size or whether they possess names is either futile or must be considered as non-dispositive criteria. Should the samples or even the asteroids themselves be considered as the shared sand or the seashells? Such are the questions when considering “celestial bodies” and thus their legal definition, as this definition can then inform political, commercial, scientific, and security considerations and,

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<sup>139</sup> Byrd, *supra* note 118.

<sup>140</sup> Martinez, *supra* note 119.

<sup>141</sup> Byrd, *supra* note 118.

hopefully, advance the cause of space for all of humanity rather than serve to export our terrestrial conflicts into the cosmos.

That space should be used for peaceful purposes is not only a foregone conclusion but also an enshrined aspect of international law. The Outer Space Treaty states explicitly that “[t]he Moon and other celestial bodies shall be used...exclusively for peaceful purposes.”<sup>142</sup> Although several concepts and provisions of the Outer Space Treaty were modeled on and often compared to the Antarctic Treaty,<sup>143</sup> the Antarctic Treaty is insufficient to understand the Outer Space Treaty and cannot be duplicated and merely applied to outer space. Other sources of inspiration for space law have come from both common and statutory law, such as the Convention on the High Seas,<sup>144</sup> which states that

[t]he high seas being open to all nations, no State may validly purport to subject any part of them to its sovereignty. Freedom of the high seas is exercised under the conditions laid down by these articles and by the other rules of international law. It comprises, *inter alia*, both for coastal and non-coastal States:

- (1) Freedom of navigation;
- (2) Freedom of fishing;
- (3) Freedom to lay submarine cables and pipelines;
- (4) Freedom to fly over the high seas.

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<sup>142</sup> OST, *supra* note 7, art. IV.

<sup>143</sup> Armel Kerrest, *Outer Space as International Space: Lessons from Antarctica*, SMITHSONIAN (2011), <https://repository.si.edu/handle/10088/16169>.

<sup>144</sup> Convention on the High Seas, Apr. 29, 1958, 450 U.N.T.S. 11. The 1958 Convention on the High Seas was the result of the first United Nations Conference on the Law of the Seas. A second United Nations Conference on the Law of the Seas gathered in 1960 but did not result in any new agreements. The third United Nations Conference on the Law of the Sea concluded with an agreement in 1982: Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397 [hereinafter UNCLOS]. While the United States has not ratified the UNCLOS, the United States, under President Ronald Reagan declared that the United States will accept and act in accordance with the provisions of the Convention relating to traditional (non-seabed) uses of the ocean, such as navigation and overflight. Statement on United States Ocean Policy, REAGAN PRESIDENTIAL LIBRARY (March 10, 1983), <https://www.reaganlibrary.gov/archives/speech/statement-united-states-oceans-policy>.

These freedoms, and others which are recognized by the general principles of international law, shall be exercised by all States with reasonable regard to the interests of other States in their exercise of the freedom of the high seas.<sup>145</sup>

In considering space law in the context of maritime law, some objects in outer space are more akin to fish in the sea, rather than the sea itself or “any part” thereof.

Consider Pop’s comparison of icebergs with comets (often referred to as dirty snowballs), which draws similar comparisons to the examples above contrasting seashells with the beach, or individual fish versus the whole sea.

It is to be noted that icebergs have as well a rather unclear legal status as though their small-scale exploitation has already begun. Like asteroids and comets, icebergs have a spatial dimension but are used mainly in their material dimension as a floating mineral resource. While Article 89 of the UN Convention on the Law of the Sea prohibits the national appropriation of the high seas, we have no knowledge of states that have protested the appropriation of icebergs. In the same time, we have no knowledge of a formal declaration of ownership over icebergs by the entities using them in their material extension; the principle of extraction seems to apply, given that icebergs have been appropriated either in their entirety or displaced from their initial location, or parts of them have been moved away without claims being laid for the exclusion of others from the exploitation of that particular iceberg.<sup>146</sup>

We cannot speak about any and all space objects and/or objects in space as those can be artificial on the one hand and the compositional parts of a greater whole.<sup>147</sup> In fact, the definitive “A Guide to Space Law Terms” does not include a separate entry for “celestial bodies” but rather uses the term to help define other entries.<sup>148</sup>

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<sup>145</sup> Convention on the High Seas, *supra* note 144, art. II.

<sup>146</sup> POP, *supra* note 51, at 57.

<sup>147</sup> Henry R. Hertzfeld, Liana X. Yung & Daniel V. Osborne, *A Guide to Space Law Terms*, SECURE WORLD. FOUND. (2012), [https://swfound.org/media/99172/guide\\_to\\_space\\_law\\_terms.pdf](https://swfound.org/media/99172/guide_to_space_law_terms.pdf).

<sup>148</sup> *Id.*

## iii. Movable versus Immovable

One argument that has been raised in defining “celestial bodies” is whether an object is moveable. This proposal, elegantly articulated by Pop, suggests that the distinction between moveable and immovable allows one to consider and “distinguish between immovables – celestial bodies – and movables in outer space literally, according to the actual ability to move them.”<sup>149</sup> Pop argues that the fact of moveability and the actual movement of an object would render it appropriable and thus seemingly outside of the definition of “celestial bodies” under Article II of the OST.<sup>150</sup>

Smirnoff, in his work, also notes that the scholarly history on the subject dates to Working Group III of the International Institute of Space Law, which asserted that celestial bodies should be considered, in the legal sense, as “natural objects in outer space . . . which cannot be artificially moved from their natural orbits.”<sup>151</sup> While, again, this view and the arguments extending therefrom are hugely helpful, they are incomplete as we must immediately recognize the rapid advances in technology that would allow an ever-growing number of objects in the cosmos to be moved at a later date. As far back as Archimedes, there was an understanding that even the Earth itself could be moved when he stated, “Give me a lever long enough and a fulcrum on which to place it, and I shall move the world.”<sup>152</sup> Science fiction literature is replete with storylines envisioning the movement of objects with astounding mass. In fact, serious theorists have also posited strategies to move the Earth to maintain a favorable position relative to the sun throughout the coming eons to ensure continued habitability by life on the planet.<sup>153</sup> So, again, if one could eventually move the Earth itself,<sup>154</sup> any definition of “celestial bodies” would need not only to specify a list of objects and/or classes of objects more clearly but perhaps also

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<sup>149</sup> POP, *supra* note 51, at 53.

<sup>150</sup> *Id.*

<sup>151</sup> SMIRNOFF, *supra* note 117; *see also* FASAN, *supra* note 122, at 40.

<sup>152</sup> This remark, attributed to Archimedes, is quoted by Pappus of Alexandria in *Collection* or *Synagoge* Book VII, 340. More information and variations can be found here: <https://math.nyu.edu/Archimedes/Lever/LeverIntro.html>.

<sup>153</sup> *See generally* D.C. Korycansky et al., *Astronomical Engineering: A Strategy for Modifying Planetary Orbits*, 275 *ASTROPHYSICS & SPACE SCI.* 349 (2001).

<sup>154</sup> *See, e.g.,* Science and Futurism with Isaac Arthur, *Planet Ships*, <https://www.youtube.com/watch?v=oim7VvUURd8>.



take into account size, mass, and even current and future technological capabilities of humanity.

#### iv. Spatial versus Functional/Object Approaches

Another related, though distinct, discussion regarding “celestial bodies” relates to the spatial versus functional argument. We recall the metaphor above regarding the seashell on the beach versus the entire quantity of the sand. While this thought experiment helps make a point, it is limited in its practical application to the present question. What, for example, should we do with a child seeking to take home a bucket of sand from the beach? What about two buckets? Where do we draw the line?

Again, Pop provides a helpful, though insufficient, understanding of this framework. Pop explains that “[w]here there is no natural boundary, *or one cannot discover it*, law can set a conventional boundary. Such is the case with the age of legal adulthood – while virtually as [im]mature as a day ago, a person that just turned 18 has different rights and responsibilities than before.”<sup>155</sup> This understanding identifies a set of criteria to consider but does not answer the question. To elucidate the point, Pop cites Gyula Gal, to demonstrate that determining the limits between outer space and air space has confounded experts for decades.<sup>156</sup> Pop also notes that “setting a spatial boundary between territorial sea and the high seas” is also illustrative of the challenges, arbitrariness, and mutability, or relying exclusively on a spatialist approach.<sup>157</sup>

However, noting that one *can* create an arbitrary boundary between different classes of things does not help determine where that boundary is or should be. Moreover, even within these distinctions, there are limitations and exceptions. Those individuals reaching the age of maturity but possessing serious, violent criminal records are often prohibited from exercising the right to vote, possess firearms, or engage in other activities otherwise granted to all other legal adults. Individuals with severe visual impairment, despite otherwise qualifying, are not permitted to operate a motor

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<sup>155</sup> See POP, *supra* note 51, at 52.

<sup>156</sup> *Id.* See also Gyula Gal, *Thirty Years of Functionalism*, in 40 PROC. COLL. L. OUTER SPACE 125 (1997).

<sup>157</sup> POP, *supra* note 51, at 52.

vehicle. Which crimes would trigger the former, and what degree of visual impairment would impose the latter?

Pop again employs Gal to suggest another approach to answering the question regarding “celestial bodies,” which requires us to consider not the nature of the object or its characteristics but the actions applied to such objects or phenomena and how they are to be used—known as a “functionalist” approach.<sup>158</sup> One proposed functional or objective use of a natural space object would be the reformation of the same into a space habitat or space station,<sup>159</sup> losing its natural appearance, together with its possible legal status of “celestial body” by becoming a humanmade structure, i.e., legally a space object. This author would suggest that this approach is also insufficient as (a) once an object is deemed a “celestial body,” the same prohibitions would apply regardless of the use in most cases, but especially in the use and consumption of the object, and (b) if the item is not deemed a “celestial body” the use to which it is put is irrelevant. Instead, once more, we could consider the idea of functionalism as part of a greater complexity of criteria in defining what is or is not a “celestial body.”

#### v. Other matters for consideration: Physical Phenomena— Lagrange Points

Another area for consideration when discussing “celestial bodies” is whether intangible features should be considered. What are lawyers and scholars to think of Lagrange Points?<sup>160</sup> Currently, many Lagrange Points are occupied by artificial objects, such as the European Space Agency’s (ESA) Solar and Heliospheric Observatory (SOHO); NASA’s Global Geospace Science (GGS) *Wind*

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<sup>158</sup> POP, *supra* note 51, *Id.* at 55.

<sup>159</sup> One example of such structures, essentially space habitats of varying sizes and capacities, are colloquially known as O’Neill Cylinders in reference to their conception by Gerard K. O’Neill. O’Neill Cylinders could be created out of the raw materials of asteroids or other celestial objects through simply hollowing out the body or by refashioning the raw materials themselves. *See, e.g.*, Gerard K. O’Neill, *The Colonization of Space*, 27 PHYSICS TODAY 32 (1974).

<sup>160</sup> A Lagrange point is a location in space where the combined gravitational forces of two large bodies, such as Earth and the sun or Earth and the Moon, equal the centrifugal force felt by a much smaller third body. The interaction of the forces creates a point of equilibrium where a spacecraft may be “parked” to make observations, or engage in other activities. *See* Elizabeth Howell, *Lagrange Points: Parking Spaces in Space*, SPACE.COM (Aug. 21, 2017), <https://www.space.com/30302-lagrange-points.html>.

satellite; NASA's Advanced Composition Explorer (ACE or Explorer 71); NOAA's Deep Space Climate Observatory (L1); the ESA Gaia probe; the joint Russian-German high-energy astrophysics observatory Spektr-RG; and the NASA, ESA and CSA James Webb Space Telescope (L2).<sup>161</sup> These locations are of great value as theoretically, less energy would need to be expended to maintain an object, such as a satellite or even a space station, at those locations. Moreover, as Lagrange Points can exist between any two large bodies, numerous Lagrange Points exist throughout the solar system outside of the Earth-Sun or Earth-Moon systems.<sup>162</sup> In considering the idea of what a "celestial body" is or is not, we must also entertain the notion of including Lagrange Points. How we consider Lagrange Points would then naturally lead to the legal precedent to apply. If they are to be considered "celestial bodies," their treatment would be governed by one set of principles and restrictions, whereas if they were excluded from this definition, new questions would arise as to whether they would be treated as *res communis omnium*, and, in that case, whether objects occupying any one Lagrange Point would be subject to the legal framework of "innocent passage."

#### IV. POSSIBLE DEFINITIONS AND SOLUTIONS:

We must first acknowledge and accept the idea that every speck of dust in the cosmos is not and cannot be considered a "celestial body." Lacking any further clarifying definitions or limitations on the meaning of the term "celestial bodies," we cannot, therefore, just assume that any natural object, or phenomenon for that matter, in space, is a "celestial body." Beginning from that premise and the self-evident notion that there are objects in the solar system that are indisputably "celestial bodies," we must find the boundary or defining criteria of what is and is not a "celestial body." We must also accept that prior scholarship is a helpful guide but insufficient. We must recognize that the proposition offered by Pop<sup>163</sup> that we can limit ourselves merely to the objects (or

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<sup>161</sup> *What is a Lagrange Point?*, NAT'L AERONAUTICS AND SPACE ADMIN. (Sept. 4, 2023), <https://solarsystem.nasa.gov/resources/754/what-is-a-lagrange-point/>.

<sup>162</sup> For an informal community-sourced list of objects at Lagrange Points, see Wikipedia, List of Objects at Lagrange Points, <https://encyclopedia.pub/entry/33490> (last visited Nov. 16, 2023).

<sup>163</sup> See POP, *supra* note 51.

phenomena) under consideration and not the actors physically interacting with them has been superseded by national legislation and international agreements. We are forced to engage in a formulaic application of science and law. Some areas for consideration follow.

#### A. *Current or Near-Term Anticipated Technology*

Just as with the beach and seashell analogy described above, looking at what current or near-term anticipated technology might achieve could be a basis for aiding in defining “celestial bodies.” Several private enterprises have declared their intentions to exploit the solar system’s resources both for-profit and to support humanity’s expansion into the cosmos, which appears to be permissible if not endorsed by several nations’ commercial space legislation and international agreements, as described above. Any limitations to these plans lie not with the technical capability to achieve these objectives, as they will surely be achieved depending on the time-scale considered, but rather the legal framework when considering mining and resource exploitation in outer space. While the Outer Space Treaty would seem to prevent any and all such extraterrestrial mining undertakings, there could be a solution if we limit the definition of “celestial body.” If “celestial body” is read to exclude any objects that could be captured, manipulated, or consumed in its entirety within a reasonable period of time, say within the technological capabilities we anticipate being possible within the next 100 years, these proposed activities would not run afoul of the OST.

To consider a possible example: The Bingham Canyon open-pit copper mine is the largest mine in the world.<sup>164</sup> It has been in operation for over 100 years and “is estimated to hold around 19 million tons of copper.”<sup>165</sup> The pit is over 1.2 km deep, approximately 4km wide, and covers nearly 8 km<sup>2</sup>.<sup>166</sup> If we were to assume that, eventually, the ability to capture, exploit, and consume an object equal in size and mass to the Bingham Canyon mine, we could, through

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<sup>164</sup> India Berry, *Top 10 Largest Mines in the World*, MINING (OCT. 29, 2021), <https://miningdigital.com/top10/top-10-largest-mines-world>.

<sup>165</sup> *Id.*

<sup>166</sup> Cecilia Jamasmie, *Rio Tinto’s Kennecott Wins Clean Air Lawsuit in the US*, MINING (June 9, 2016), <https://www.mining.com/rio-tintos-kennecott-wins-clean-air-lawsuit-in-the-us/>.

legislation at the national level and via international agreements, exclude such objects from classification as “celestial objects.” Objects within the solar system that could be captured and placed within the exclusive control of any operator and subsequently exploited or consumed within an expected 100-year time-horizon using current or near-term technical capabilities would open significant commercial and scientific opportunities to humanity.

We must also appreciate the fact, however, that allowing such limitations to the definition of “celestial bodies” alone would not be sufficient and could undermine the other purposes of the Outer Space Treaty, namely, the peaceful use of Outer Space and the avoidance of the export of terrestrial conflict into Outer Space if it triggered a resource free-for-all that saw nations, entities and individuals competing over each and every resource as it became accessible. Terrestrial actors (and eventually even extraterrestrial actors, such as those based on or incorporated under a Moon- or Mars-based legal regime) would need to agree how even these excluded objects would be claimed for ownership, appropriation, and use.

*B. Establish an Arbitrary but Agreeable Definition and Catalogue of Celestial Bodies*

The above criterion of a technology-based, size and mass-derived definition of what is or is not a “celestial body” is, itself, arbitrary. Who is to say, for example, what technological capabilities may exist in the coming decade or century? Moreover, technological capability does not, *ipso facto*, result in a feasible or economically viable deployment of such capabilities. Much like the arbitrary but agreed-upon age of maturity for the purposes of certain rights and responsibilities in the myriad terrestrial jurisdictions, national legislation and international agreements could seek to define “celestial bodies” in an arbitrary but agreeable fashion. In addition to the size and mass as mentioned above, Earth-based authorities could establish a list of those objects deemed part of the “Common Heritage of Humanity” and, therefore, “celestial bodies” within the Solar System, at the exclusion of any and all other objects of any mass. This list could be subject to revision, much like Pluto was expelled from the IAU’s list of “planets” not so long ago. However, here, objects or “celestial bodies” would not need to fit into nice and orderly categories but could be individually listed. The author would also propose

that any celestial objects heretofore undiscovered or unidentified would not meaningfully be called a “celestial object” protected from appropriation and use in any event, so the list could be exhaustive and would likely get parred down over time rather than expanded. Therefore, in addition to other considerations, we could add an arbitrary agreed date of discovery to the definition of “celestial bodies” and exclude any and all objects or phenomena discovered thereafter.<sup>167</sup>

Such a list could recognize that there are certain objects that, due to their role in humanity’s history, either as inspiration for religion, culture, literature, or otherwise, possess a special place and are, thus, the preserved “celestial bodies” of the OST. Most legislative or deliberative bodies would likely include in this list all the named planets, many if not most or all of their natural satellites, and numerous asteroid belt and Kuiper belt objects. Beyond this list, however long it may become, extraterrestrial objects, materials, and phenomena might be available for legally recognizable appropriation and use. Such a formula may be deemed to suit the needs of terrestrial authorities hoping to encourage scientific and economic activity in outer space.

## V. CONCLUSION

Humanity rightly sought to preempt the exportation of Earthly conflict into the cosmos. In crafting the Outer Space Treaty, the authors of space law’s *Magna Carta* identified the pressing issues that could, would, and today imminently will confront nations and private actors alike. As technology advances, however, greater clarity is required to refine and define the terms of the OST further in such a way that its purpose—peaceful use of outer space for all humanity, whether scientific or commercial—can be realized. The solutions offered in the past provide laudable guideposts, too, to advance this discussion, though national and international actions, as well as technical and scientific discoveries, reveal that further discussion must continue to define and apply the terms and

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<sup>167</sup> The author would suggest that given the vast number of auspicious dates in extraterrestrial exploratory history, many dates will do, but some suggestions are as follows: October 4, 2007 to honor the 50<sup>th</sup> anniversary of earth’s first artificial satellite, *Sputnik 1*; July 20, 2019 to commemorate the 50<sup>th</sup> anniversary of the first human to set foot on the Moon.

applicability of the Outer Space Treaty more fully. The above examination of the issue aims to advance that discussion further and provide some additional elements for consideration in determining what a “celestial body” is. Building off the works of the likes of Gorove and Pop, the above analysis and considerations are designed to fill in the outstanding gaps in this field while remaining flexible in the face of future developments. Take, for example, the possibility that at some future date, humanity will discover biology on an otherwise unremarkable object. Whether an asteroid or, more likely, a Kuiper Belt Object, this mass, whatever its size or other characteristics, can quickly be included in the finite list proposed above for protection and preservation without otherwise altering the proposed “celestial bodies” classification system. To begin, each of the named planets and dwarf planets, along with their largest natural satellites, should be included in such a listing. So, too, should the most recognizable comets, such as Haley’s and Hale-Bopp, although the latter will not return to the inner solar system for millennia. Beyond that, it would be for humanity to decide.

# IS THE SPEED OF LAW FASTER THAN THE SPEED OF LIGHT: CONSIDERATIONS OF THE IMPACT OF SPECIAL RELATIVITY ON THE OPERATION OF LAW IN THE CONTEXT OF DEEP SPACE MISSIONS

*Alex Simmonds\**

## ABSTRACT

Travel to, exploration—and potential colonization—of Mars has been a long-held ambition for certain spacefaring nations. Questions arising the methods of propulsion, landing sites, habitation, nutrition, and the challenges of traveling for extended periods in isolated conditions make for fertile and useful debate. This article considers the substantive challenges such a journey would pose for the operation of the rule of law and various legal matters arising between a crew in deep space/on Mars and individuals based on Earth, specifically as regards the time delay factor involved in communication between such parties as per the theory of Special Relativity. When, for example, would a legislative enactment on Earth bind individuals 20 minutes away at the speed of light? Regarding commercial matters, how would time delay impact contractual formation, and how does the law relating to criminal intention operate if the consequences thereof are not felt instantaneously? This article raises both philosophical and practical considerations and ultimately concludes that valuable research should be conducted prior to any such deep-space missions. At the very minimum, soft law guidance on time delay matters should be established, and, more ambitiously, a Deep Space Legal Framework ought to be considered. This would serve as a counterbalance to any anxious legal uncertainty between deep space crews and Earth-based entities whilst

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also, very importantly, ensuring the safe passage of the rule of law from the Earth into the deeper reaches of the solar system.

## I. INTRODUCTION

This article is a substantive development on a paper that was presented in Frisco, Texas, on May 27th at the International Space Development Conference 2023, “*In Space the Other Side Should Have the Right to Be Heard*.”<sup>1</sup> That paper concerned the theoretical position in which an Earth-based individual would be either involved in a legal dispute with an individual on Mars—or en route to Mars—or be called on to adjudicate a legal dispute between two other individuals in circumstances where the rules of natural justice/procedural fairness may cast doubt on their suitability for such a task. It held that, in legal disputes involving individuals in deep space, certain communication techniques associated with a legal investigation—specifically the process of cross-examination—may lose their effectiveness owing to the associated time delay. The process of cross-examination—which gets its strength from the unbroken sequence of questions and answers— as stated by the English Judge, Lord Denning<sup>2</sup>—would not be able to function effectively since those on the receiving end of the question would have a significant amount of time in which to contemplate further questions owing to the involved time delay. A Mars-based individual could potentially have a wait of around 48 minutes to receive the next question during live proceedings.<sup>3</sup> This would undermine the effectiveness of such a device as a means of uncovering objective truths by means of a legal or quasi-legal enquiry.

This article takes this theme a step further, addressing a significant gap in the legal and scientific literature by questioning the potential impact of time delay on substantive rule of law and common legal problems. It is built upon the premise that, given the range of human interaction and relationships, the possibility for a legal dispute to arise between an Earth-based entity and an

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<sup>1</sup> Alex Simmonds, *In Space the Other Side Should Have the Right to be Heard*, 28 COVENTRY L. J. 23 (2023).

<sup>2</sup> See *Jones v. National Coal Board*, 2 Q.B. 55, 65 (1957).

<sup>3</sup> Thomas Ormston, *Time Delay Between Mars and Earth*, EUR. SPACE AGENCY (Aug. 5, 2012), <https://blogs.esa.int/mex/2012/08/05/time-delay-between-mars-and-earth/>.

individual in deep space will be ever-present on deep-space journeys. This is more likely when we consider that such missions could last upwards of two years or more. Given the well-known discourse in this area,<sup>4</sup> it is likely that the first individuals to venture into “deep space” will be traveling towards Mars, therefore, this article will make frequent references to Mars as a probable/theoretical location throughout. Regarding the parameters of what “deep space” could be classified as for the purposes of this article, this could be any distance away from the Earth which results in a significant time delay as regards communications between Earth and the individuals in question. As suggested in the conclusions, the question of how long any given delay would have to be before it becomes a valid concern is beyond the scope of this article but nonetheless remains an important matter.

The scientific basis for time delay can be taken from the second postulate of Einstein’s theory of Special Relativity,<sup>5</sup> namely that: “[a]ny ray of light moves in the ‘stationary’ system of co-ordinates with the determined velocity  $c$ , whether the ray be emitted by a stationary or by a moving body.”<sup>6</sup> Hence Velocity=light path/Time interval<sup>7</sup>

Presently, any communications between those based on Earth (referred to throughout this article as Earth-based entities) and those in “deep space” (for the purpose of this article defined as any distance from Earth incurring a significant time delay) will be carried by radio waves which are themselves carried at the speed of light. As a space traveler moves further away from Earth, the amount of time taken for radio waves to reach the traveler from Earth will increase consonantly with this principle. This is already a documented phenomenon as can be seen from the Apollo missions whereby there was a delay of around three seconds for answers to questions asked at Mission Control to come back to Earth from the

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<sup>4</sup> See e.g., Nadia Drake, *Elon Musk: A Million Humans Could Live on Mars by the 2060s*, NAT’L GEOGRAPHIC (Sept. 27, 2016), <https://www.nationalgeographic.com/science/article/elon-musk-spacex-exploring-mars-planets-space-science>.

<sup>5</sup> See Albert Einstein, *On the Electrodynamics of Moving Bodies* (June 30, 1905), <https://www.fourmilab.ch/etexts/einstein/specrel/specrel.pdf>.

<sup>6</sup> *Id.* at 4.

<sup>7</sup> *Id.*

astronauts orbiting the Moon.<sup>8</sup> Using Mars as a reference point using an Ultra High Frequency antenna it can generally take between five and twenty minutes for radio signals to travel between Earth and Mars,<sup>9</sup> and as long as 24 minutes.<sup>10</sup>

That legal jurisdiction extends to those in space is relatively uncontroversial.<sup>11</sup> As has been written, “[t]he general principle governing jurisdiction, including criminal jurisdiction, in outer space provides that the State of registry exercises jurisdiction over the space objects recorded in its national space registry and the persons on board these objects, regardless of their nationality.”<sup>12</sup>

In line with current levels of technological progress and ambition, it is highly likely that the United States (US) will be the State of registry for the first deep space missions, but, in theory at least, the State of registry could be that of any spacefaring nation or, potentially, one used as a flag of convenience. Regardless of which State has jurisdiction over the mission, the potential legal problems are likely to be the same, and certain legal rules in a variety of areas may not be able to withstand the stresses of deep space travel brought about by Special Relativity. Therefore, this article examines the potential impact of time delay factors in respect of the promulgation of laws on Earth and their effective commencement times in deep space on four key areas: contract law; tort law; criminal law; with an emphasis on commercial law dimensions. The exercise will largely be framed in terms of English law but will also include some reference to the rules and practices of other jurisdictions.

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<sup>8</sup> See, e.g., *Apollo Flight Journal, Apollo 8, Day 4: Lunar Orbits 7,8, and 9*, NAT'L AERONAUTICS AND SPACE ADMIN., [https://web.archive.org/web/20110104032114/http://history.nasa.gov/ap08fj/15day4\\_orbits789.htm](https://web.archive.org/web/20110104032114/http://history.nasa.gov/ap08fj/15day4_orbits789.htm) (last visited July 29, 2023); *How Did Apollo 11 Communicate with Earth?*, APOLLO11SPACE, <https://apollo11space.com/how-did-apollo-11-communicate-with-earth-2/>.

<sup>9</sup> NASA Science, *Mars 2020 Mission Perseverance Rover*, <https://Mars.nasa.gov/Mars2020/spacecraft/rover/communications/> (last visited July 29, 2023).

<sup>10</sup> See Drake, *supra* note 4.

<sup>11</sup> See Helen Shin, *Oh, I Have Slipped the Surly Bonds of Earth: Multinational Space Stations and Choice of Law*, 78 CAL. L. R. 1375, 1376 (1990). See also Julian Hermida, *Crimes in Space, A Legal and Criminological Approach to Criminal Acts in Outer Space*, 31 ANN. AIR & SPACE L. 4 (2006); Michael Chatzipanagiotis, *Criminal Issues in International Space Law*, 18 EUR. J. L. REFORM 105 (2016).

<sup>12</sup> Hermida, *supra* note 11 at 6.

It should be established that the author does not hold this article out as having explored every potential area of law that time delay could impact on deep space journeys but, rather, that it seeks to explore some of the most likely to occur—save for arguably some of the matters involving criminal law. The criminal law matters are themselves an important area for discussion as they raise several interesting philosophical points regarding the nature of the law itself which are worthy of consideration.

The article concludes with the assertion that, regarding certain areas of law, a common legal framework should be devised in advance of any proposed deep-space operations to counter some of the anticipated difficulties arising. Such a framework could take the form of soft law guidance, or a binding multilateral agreement put forward ahead of any deep space operations. Such a framework will be of particular relevance to commercial and contractual matters, particularly those regarding contractual formation.

## II. TIME DELAY PROMULGATION AND PUBLICATION OF LEGISLATIVE ENACTMENTS

Before we examine the potential impact of time delay on specific areas of law, one fundamental area that must be considered is that of promulgation—or enactment—of laws on Earth. This could affect any kind of legal dispute arising. As outlined previously it is a relatively uncontroversial point that crew members on deep space missions will still be bound by the laws of Earth-based jurisdictions. It almost goes without saying that, as a matter of judicial notice, Earth-based jurisdictions are in the habit of regularly passing laws on a range of matters, both civil and criminal, through their local governmental legislative apparatus. In line with the opening point, there is no reason why relevant legislation passed in such a manner would exclude those presently in deep space or forming part of an expedition on Martian soil. Legislation in most—if not all—jurisdictions, will have what is known as a “commencement date” or some equivalent term, which determines when, exactly, a piece of legislation will come into force or “become law.” In the United Kingdom (UK) this will be at midnight on the day of “Royal Assent,” the stage in the law-making process whereby the reigning Monarch—at least

nominally—signs the law into force unless some other date is specified.<sup>13</sup>

As outlined, time delay factors associated with Special Relativity would mean that the full text of a legal enactment as it comes into force would not be visible to those in deep space or on Mars for potentially up to 24 minutes. If a crew member or Mars explorer were to contravene the provisions of an enactment which would be in force on Earth at, for arguments sake, midnight UK time, at 15 minutes past midnight, but the full text of the Act were not available to them owing to special relativity until 24 minutes past midnight, could they be said to be in contravention of a legitimately promulgated law?

In the case of *R v. Logan*,<sup>14</sup> British soldiers stationed in Hong Kong were found to have committed an offense at 2:30 AM, Hong Kong standard time, on the 1st of January 1957 contrary to the UK Army Act of 1955 which too had a commencement date of the 1st of January 1957.<sup>15</sup> The argument at trial was that, given the fact that Hong Kong is eight hours ahead of the UK, the Act itself could not yet be said to be in force since the time for commencement had not yet been reached in the UK.<sup>16</sup> The argument ran that, given it was still December 31 in the United Kingdom, a statute with the commencement date of January 1 could not yet be said to be in force.<sup>17</sup> This argument was rejected by the Lord Chief Justice, Lord Goddard:

If an Act is said to come into force on January 1, it comes into force on the day which is January 1 in the particular place where the Act has to be applied...[T]he fact that it became January 1 in Hong Kong a few hours before the clock would actually show January 1 in England does not make any difference. As the Act comes into force on January 1, 1957, in Hong Kong, it comes into force on the day which is January 1 in Hong Kong.<sup>18</sup>

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<sup>13</sup> *Royal Assent*, THE PARLIAMENT OF THE U.K., <https://www.parliament.uk/about/how/laws/passage-bill/lords/lrds-royal-assent/> (last visited July 29, 2023).

<sup>14</sup> *R v. Logan* (1957) 2 QB 589, 589.

<sup>15</sup> *Id.*

<sup>16</sup> *Id.* at 589-90.

<sup>17</sup> *Id.* at 590.

<sup>18</sup> *Id.* at 591.

How time will be determined on board any deep space voyage is yet to be seen. It is interesting to note, however, that the International Space Station runs on Greenwich Mean Time,<sup>19</sup> a time which has, historically in England and Wales, been fixed by statute for the purposes of laws applying within the UK. Section 1 of the Statutes (Definition of Time) Act 1880 provides that:

Whenever any expression of time occurs in any Act of Parliament, deed, or other legal instrument, the time referred shall, unless it is otherwise specifically stated, be held in the case of Great Britain to be Greenwich mean time, and in the case of Ireland, Dublin mean time.<sup>20</sup>

This is carried forward by Section 9 of the Interpretation Act 1978 which states:

Subject to section 3 of the Summer Time Act 1972 (construction of references to points of time during the period of summer time), whenever an expression of time occurs in an Act, the time referred to shall, unless it is otherwise specifically stated, be held to be Greenwich mean time.<sup>21</sup>

On this reasoning, then, it would seem that crew members in deep space or on Mars could become instantly bound by any law enacted on Earth, despite the restraints of space-time. This is, of course, pending the outcome of any arguments regarding Special/General Relativity in this sense. Given that a mission into deep space towards Mars would potentially be traveling at around 39,600 km/h<sup>22</sup>—not remotely close to light speed—factors of time dilation may not come into play in any significant manner.

An argument based on Special Relativity, however, could postulate that any given legal enactment on Earth, by means of the associated time delay between two points in Space-Time, may not, in a relative sense, have been promulgated as regards a crew in deep space 20 minutes away at the speed of light. If we take the

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<sup>19</sup> Deborah C. Navarro Morales et al., *Time Perception in Astronauts on Board the International Space Station*, NPJ MICROGRAVITY 9, 5 (Jan. 19, 2023), <https://www.nature.com/articles/s41526-023-00250-x>.

<sup>20</sup> Statutes (Definition of Time) Act 1880, 43 & 44 Vict. c. 9 § 1 (UK).

<sup>21</sup> Interpretation Act 1978 ch. 30 § 9 (UK).

<sup>22</sup> NASA Science, *Mars Perseverance Rover-Cruise*, <https://Mars.nasa.gov/Mars2020/timeline/cruise/> (last visited July 29, 2023).

case of *R v. Logan* once more and consider the facts as if they were slightly different, we may see how such an argument could be mounted.

With Special Relativity, the associated time delay between Earth and Mars could, as has been repeatedly stated, be as much as 24 minutes. Light will, in such cases, take 24 minutes to reach Mars. Effectively, therefore, Mars—at such a juncture—could be said to be 24 minutes *behind* rather than *ahead* of Earth. In *R v. Logan* it was January 1 when the defendants actually were at the time they committed the offence—the commencement date of the statute itself—hence, they came within the ambit of the statute as this was consistent with the commencement date. If the defendants had been in South Georgia and the South Sandwich Islands, which is two hours behind the United Kingdom in Coordinated Universal Time (UTC), then they would have still been in December 31 at the time the Act came into force on January 1 and hence, it could be strongly argued that they would not be able to be charged under it. The counterargument could run that the Act simply applies to all material places since, as per the Interpretation Act 1978,<sup>23</sup> any provisions as to time are to be taken to mean Greenwich Mean Time (GMT), and the statute simply comes into force in all material places at midnight GMT on the date specified. However, the question of whether this could be logically sustained in the context of deep space travel would not be as easy to resolve. On one level, it could be argued that, from the perspective of travelers more than 20 minutes away, true Greenwich Mean Time has not yet occurred in reality, unless there is an argument to say that the law simply moves faster than the speed of light.

Let's say we accept this argument and say that, for the purposes of promulgation at least, the law effectively travels faster than the speed of light—as soon as a law comes into force on Earth it immediately comes into force for all those subject to its jurisdiction regardless of their position in time and space. One possible counterargument which goes to the heart of legal legitimacy is that of making the law available. This principle was recognized by Thomas Hobbes in his seminal work, *Leviathan*, “[t]he want of

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<sup>23</sup> Interpretation Act, *supra* note 21.

means to know the law, totally Excuseth: For the Law whereof a man has no means to enforme himself, is not obligatory.”<sup>24</sup>

Moreover, as the famed jurist Lon Fuller stated in *The Morality of Law*, “[a] formalized standard of promulgation not only tells the lawmaker where to publish his laws; it also lets the subject—or a lawyer representing his interests—know where to go to learn what the law is.”<sup>25</sup>

Although any given legislative enactment in question could be “available” in one sense—it may be online in draft form as is commonly the case in a lot of jurisdictions<sup>26</sup>—in another sense the actual law is not yet published since it has not yet passed the commencement date.

As the revered Lord Bingham of Cornhill said:

. . . no one should be punished under a law unless it is sufficiently clear and certain to enable him to know what conduct is forbidden before he does it; and no one should be punished for any act which was not clearly and ascertainably punishable when the act was done.<sup>27</sup>

Further, as evinced by Lord Diplock in *Fothergill v. Monarch Airlines*:

Elementary justice or, to use the concept often cited by the European Court, the need for legal certainty demands that the rules by which the citizen is to be bound should be ascertainable by him (or, more realistically, by a competent lawyer advising him) by reference to identifiable sources that are publicly accessible.<sup>28</sup>

This, of course, presupposes that crew members on deep space missions have access to published laws at all, as Gardner stated:

According to the ideal of the Rule of Law, the law must be such that those subject to it can reliably be guided by it, either to avoid violating it or to build the legal consequences of having

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<sup>24</sup> THOMAS HOBBS, LEVIATHAN CH. XXVII (1651).

<sup>25</sup> LON L. FULLER, THE MORALITY OF LAW 43-4 (2d ed. 1969).

<sup>26</sup> See, e.g., UK Parliament, *Draft Legislation*, <https://www.parliament.uk/site-information/azindex/draft-legislation/> (last visited July 29, 2023).

<sup>27</sup> R v. Rimmington (2006)1 AC 459, 482 (House of Lords).

<sup>28</sup> Fothergill v. Monarch Airlines Ltd., (1981) AC 251, 279 (House of Lords).



violated it into their thinking about what future actions may be open to them. People must be able to find out what the law is and to factor it into their practical deliberations. The law must avoid taking people by surprise, ambushing them, putting them into conflict with its requirements in such a way as to defeat their expectations and frustrate their plans.<sup>29</sup>

For argument's sake, let's assume that, in theory, a deep space crew would have access to some form of internet via radio transmission, albeit one whose "transmissions" would be subject to considerations of Special Relativity, and, thus, theoretical access to all relevant statute laws and legislative enactments back on Earth. This still admits the prospect of applicable enactments being "unavailable" or "undiscoverable" for a period of up to 24 minutes from the date of their publication. Notwithstanding this consideration—or the other less desirable position of having no access to any laws at all—the ancient argument of "ignorance of the law is no excuse" or *ignorantia juris non excusat*, could possibly be attempted here—and, optimistically perhaps, in support of the position previously stated that the law moves faster than the speed of light.

According to Blackstone's Commentaries of England, this rule is originally of Roman origin,<sup>30</sup> and can be found across many legal systems, including the United States where it has been said that "[t]he general rule that ignorance of the law or a mistake of law is no defense to criminal prosecution is deeply rooted in the American legal system."<sup>31</sup>

Moving against such an assertion, the common law has analogous instances whereby "ignorance of the law" has been found to be a defense. Consider, for example, the case of *R v. Bailey*,<sup>32</sup> concerning the captain of a vessel—The Langley—who was indicted for "maliciously shooting" at another vessel, called the Admiral Nelson.<sup>33</sup> The Act under which the captain was indicted was passed on the May 10, 1799, and the offence occurred on June 27 of the same year.<sup>34</sup> The defendant was ultimately pardoned since there was no

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<sup>29</sup> John Gardner, *Introduction*, in PUNISHMENT AND RESPONSIBILITY: ESSAYS ON THE PHILOSOPHY OF LAW, 2ND EDITION, xxxvi (H.L.A. Hart ed. 2008).

<sup>30</sup> 4 WILLIAM BLACKSTONE, COMMENTARIES 27.

<sup>31</sup> *Cheek v. U.S.*, 498 U.S. 192, 200 (1991).

<sup>32</sup> *R v. Bailey*, 168 E.R. 651 (1800).

<sup>33</sup> *Id.* at 651.

<sup>34</sup> *Id.* at 652.

way that he could have known of the Act, having been at sea during the time of the enactment through to the time of the offence.<sup>35</sup> Technologically speaking, this is a similar position to the crew of a deep space mission vis-a-vis time delay. In neither case is there a possibility of bringing the details of the enactment to the attention of the relevant persons at the material times. Although the time delay under discussion would stand to be a much shorter period, the principle still stands—the law would not be available owing to time delay and hence, would not have any prospect of being discovered. It would arguably be contrary to the rule of law to make a crew member liable—or convict them of an offence—in such circumstances.

A similar case from Canada, *R v. Ross*,<sup>36</sup> concerned a hunter who entered the Vancouver Forest District without obtaining a written permit for the purposes of hunting on September 10, 1944.<sup>37</sup> This district had been declared as off-limits from 12-noon on September 8 by order of the Minister of Lands under the Forest Act.<sup>38</sup> The defendant had left home on September 7<sup>39</sup> and it was accepted that he had no way of knowing about the order and, hence, his conviction was quashed.<sup>40</sup>

If, then, as seen above, the concept of the law moving faster than the speed of light could potentially be inconsistent with aspects of the rule of law itself, it could be suggested that the way forward as regards deep space missions is to explicitly temper the principle of *ignorantia juris non excusat* for such scenarios.

One potentially analogous approach can be sourced from the United Kingdom's Joint Service Manual of the Law of Armed Conflict, where it is stated that, “[s]hould anyone, ignorant of the fact that an armistice has been made, commit an act of hostility by taking ground or capturing prisoners, he will not be punishable for that act although the State to which he belongs is bound to restore the ground or prisoners taken.”<sup>41</sup>

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<sup>35</sup> *Id.* at 653.

<sup>36</sup> *R. v. Ross*, 3 DLR 574 (1945)(Canada).

<sup>37</sup> *Id.* at 575

<sup>38</sup> *Id.*

<sup>39</sup> *Id.*

<sup>40</sup> *Id.* at 577.

<sup>41</sup> UK Ministry of Defense, *The Joint Service Manual of the Law of Armed Conflict*, 265, ¶ 10.22.1 (2004), <https://www.gov.uk/government/publications/jsp-383-the-joint-service-manual-of-the-law-of-armed-conflict-2004-edition> (last visited July 29, 2023).

Roughly transferring this practice to the deep space scenario would equate to travelers in deep space not being liable or “punishable” for any such act undertaken in contravention of any such legislative enactment which, by reason of time delay, they could not possibly have seen.

A potentially more nuanced approach could be adopted. Not all the world’s jurisdictions have such a hard and fast rule in this area<sup>42</sup>—as Ashworth has suggested

the defense should be based on an appropriate objective standard—what could reasonably be expected of an individual in the defendant’s position—perhaps a little broader than the defense in Germany and Sweden. The grounds of excuse would be negligence-based, what could ‘reasonably be expected,’ and it would be proper for this to be subject to capacity-based exceptions for those unable to perform this citizen’s duty.<sup>43</sup>

Such a formulation would be a sensible one to adopt in the context of deep space travel, providing an unfussy and straightforward solution to the time delay problem as it stands in respect of new enactments. Moreover, it has been suggested that such assessments should be carried out by the Courts save for situations in which it is plain that the Defendant clearly knows that the conduct is harmful,<sup>44</sup> the most notable commentator in this regard perhaps being Lon Fuller who stated that “to the extent that the law merely brings to explicit expression conceptions of right and wrong widely shared within the community, the need that enacted law be publicized and clearly stated diminishes in importance”<sup>45</sup>

Consistent with this is the ruling of the Privy Council in the case of *Christian v. The Queen*,<sup>46</sup> whereby some Pitcairn Islanders were charged with several serious sexual offenses contrary to the Sexual Offences Act 1956.<sup>47</sup> The statute law of the United Kingdom

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<sup>42</sup> See *S v. De Bloem*, 1977 (3) SA 513 (S. Afr.) (finding that ignorance of law can be an excuse).

<sup>43</sup> A.J. Ashworth, *Excusable Mistake of Law*, 1974 CRIM. L. REV. 652, 654.

<sup>44</sup> Douglas Husak & Andrew von Hirsch, *Culpability and Mistake of Law*, in ACTION AND VALUE IN CRIMINAL LAW (Stephen Shute, John Gardner & Jeremy Horder eds. 1993).

<sup>45</sup> Fuller, *supra* note 25, at 92.

<sup>46</sup> *Christian v. The Queen* (2006) UKPC 47.

<sup>47</sup> *Id.* ¶ 1.

was said to apply on the Pitcairn Islands by virtue of the Pitcairn Order 1970, but it was accepted that:

None of the relevant statutes or legal texts were sent to the island. Nor had any publications such as Halsbury's Laws of England been provided. There is no evidence that anyone on Pitcairn was aware of the provisions of sections 1 and 14 of the Sexual Offences Act 1956 prior to the commencement of the police investigation in 1996.<sup>48</sup>

Despite this, the defendants were convicted on the basis that the Act, rather than creating new offenses that the islanders could not be taken to have been aware of, merely augmented the existing common law offenses which, essentially, they were being prosecuted for. As stated by Lord Hoffman:

This feature of the legislation makes it possible to reconcile the failure to promulgate the fact that the 1956 Act was to be part of the laws of Pitcairn with the principle of legality. The islanders brought the common law of England with them when they settled there. Rape and indecent assault were part of the criminal law of the island long before the Justice Ordinance 1966 and the Judicature Ordinances 1961 and 1970 were enacted. No objection could have been taken on the ground of lack of promulgation if the prosecution of the appellants had been brought under the common law.<sup>49</sup>

Therefore, the precise nature of any laws passed can have a bearing on whether ignorance of any subsequently promulgated rules can constitute a sound defense, particularly when they may serve to supplement existing provisions.

As formed part of the discussion in the case of *R v. Ross*,<sup>50</sup> the extent of promulgation can also determine whether or not ignorance of a particular rule is a sound defense. As stated by County Court Judge Harrison:

Briefly, amongst other things, before a public Act can receive the Royal assent and become law it must first, in the form of a bill, be presented to and deliberated upon and conveyed or

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<sup>48</sup> *Id.* ¶ 68.

<sup>49</sup> *Id.* ¶ 85.

<sup>50</sup> *Ross*, *supra* note 36, at 576.

passed, through its different stages at different times and on different days, by the action of the members of the Legislative Assembly in concourse duly assembled in the proper place designated for that purpose, at which the public, including representatives of the press, are generally permitted to be present. Therefore the proceedings necessary to enact and bring into force an Act or law binding upon the public give to it a certain measure of publicity, and it is not difficult to understand why it is a general rule of law that one cannot successfully plead ignorance of such an Act or law.<sup>51</sup>

On this basis, it could be argued that any deep-space crew could indeed find themselves bound by any new enactment, providing it could be said to be a primary source of legislation. In other words, a legislation that has gone through whatever the equivalent of the parliamentary process is in the relevant jurisdiction, regardless of the time delay factor. It could be said that the new law would have been widely publicized enough through the legislative process for any crew member to have theoretically appraised themselves of the contents thereof, thus negating any technical defense on the law not technically being published until about 20 minutes after the official commencement date.

However, the position can be markedly different when it comes to secondary legislation such as statutory instruments, ordinances or bylaws, and the like. An example of this is the case of *Lim Chin Aik v. The Queen*,<sup>52</sup> which concerned section 6 of the 1952 Singapore Immigration Ordinance, of which the defendant had allegedly contravened.<sup>53</sup> The instrument itself had not been published indeed it was accepted that the full extent of the ordinance's publication was that the relevant Minister signed it and then sent it to the Deputy Assistant Controller for Immigration.<sup>54</sup> No effort had been made beyond this to bring the ordinance to the attention of either the defendant or the public at large. This was held not to have gone far enough and, as Lord Evershed stated, "[i]t seems to their Lordships that, where a man is said to have contravened an order or an order of prohibition, the common sense of the language presumes that he

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<sup>51</sup> *Id.* at 575.

<sup>52</sup> *Lim Chin Aik v. The Queen* (1963) A.C. 160 (Privy Council).

<sup>53</sup> *Id.* at 1.

<sup>54</sup> *Id.* at 2.

was aware of the order before he can be said to have contravened it.”<sup>55</sup>

It is worth noting that non-publication (or issuance) of a statutory instrument is a complete defense under English law under §3(2) of the Statutory Instruments Act 1946,<sup>56</sup> which states that:

In any proceedings against any person for an offence consisting of a contravention of any such statutory instrument, it shall be a defense to prove that the instrument had not been issued by [or under the authority of] His Majesty’s Stationery Office at the date of the alleged contravention unless it is proved that at that date reasonable steps had been taken for the purpose of bringing the purport of the instrument to the notice of the public, or of persons likely to be affected by it, or of the person charged.

In the case of our deep space crew, is simple publication on the government website in willful ignorance of the time delay factor really taking “reasonable steps?” Arguably not unless the timing of the publication is such that the delay factor is extinguished—such as the instrument being formally published around 24 minutes, or whatever the material time happens to be—earlier than the publication date/time for Earth-based entities.

Overall, the fairest approach to take regarding promulgation and deep space travelers would be for any Earth-based domestic adjudicating authority to assess whether, against the backdrop of time delay, a defendant’s “ignorance” of the law could be said to be reasonable on a case-by-case basis. As has been shown, this would be a complicated exercise since a large range of factors must be considered, particularly regarding the nature of the alleged transgression and the actual type and extent of promulgation of the law in question. There may even be some argument as to whether *ignorantia juris non excusat* applies to all legal areas or just some.<sup>57</sup> Moreover, in the interests of fairness and common sense, any decision-maker must also observe the fact that complete knowledge of

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<sup>55</sup> *Id.* at 5.

<sup>56</sup> Statutory Instruments Act, 1946, 9 and 10 Geo. 6 ch. 36 (U.K.).

<sup>57</sup> See *Osei-Bonsu v. Wandsworth London Borough Council*, (1999) 1 All ER 265 (obiter statements of the Court of Appeals).

the law in any case is a complete legal fiction. As Robert Goodin stated:

Providing every US household with a copy of the US Code—all 364 volumes of it—might maximize promulgation. Doing that would maximize the extent to which people could possibly access the law. But doing so would do little to increase the probability that they would actually know the law.

Lawyers are rightly sensitive to the importance of promulgation. But the problem here in view is not one that can be solved by promulgation. The problem is that there is simply too much law for people to sift through. Giving everyone a copy of the US Code, or putting it all on the internet, will not help with that. The problems are the same searching so much text electronically as working through a hard-copy index. In conducting a search of either sort, the problem is simply that you don't know what you don't know.<sup>58</sup>

As important as publication is to the rule of law, the reality is that, like ordinary citizens, busy personnel on deep space missions are simply, as a matter of fact, not going to be aware of each and every piece of legislation and rule that is promulgated, regardless of the surrounding publicity. As has been shown, the time delay factor simply compounds this situation. Given the exceptional circumstances of any crewed deep space operation, some form of temperance is surely necessary, and a relaxation of any blanket application of *ignorantia juris non excusat* as regards newly enacted legal instruments should be agreed upon as opposed to simply assuming that the law travels faster than the speed of light. Issues of practicality and technicality aside, if humankind is to take the rule of law into deep space and potentially to other worlds, surely it should do so on a sound footing that respects legal legitimacy.

### III. TIME AS AN ESSENTIALLY LOCAL CONCEPT

Moving away from issues of promulgation, there is significant authority to support the position that time ought to be regarded as

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<sup>58</sup> Robert E. Goodin, *An Epistemic Case for Legal Moralism*, 30(4) OXFORD J. LEGAL STUD. 615, 619 (2010).

a “local” concept in terms of certain legal matters arising.<sup>59</sup> The case of *Curtis v. March*<sup>60</sup> concerned a trial in England during a time in history where Greenwich Mean Time was not uniformly followed across the country.<sup>61</sup> The trial was held in Dorchester and on Greenwich time, despite the fact that Dorchester did not follow Greenwich time. The resulting trial was overturned on the basis that, as per Pollock CB, the relevant time should have been the time of the place itself—Dorchester time.<sup>62</sup>

This reasoning was followed in a recent case, *Euronav NV v. Repsol Trading SA*,<sup>63</sup> which involved a dispute over a charter party, specifically whether a potential breach of a demurrage clause should be assessed under the time zone where it arose or where the contract was formulated.<sup>64</sup> In this case, the alleged breach occurred in Los Angeles, but the argument was that the correct time zone should be that of the party alleging the breach, who was in Spain.<sup>65</sup> Ultimately, it was decided that the correct time should be the “local” time, i.e. that where the events arose, in this case, Los Angeles.<sup>66</sup> In reaching this conclusion, Henshaw, J quoted extensively from “Carver on Charterparties:”

The charter may specify the particular time zone by which the relevant time is to be determined, e.g. GMT or UTC. If not, local mean time should be used. (para. 7-015)<sup>67</sup>

Henshaw’s conclusions included the following:

(v) The use of local time at the place of discharge gives rise to a single, clear and easily ascertainable date and time of completion of discharge. It tends to promote certainty and reduce the risk of confusion.

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<sup>59</sup> *Euronav NV v. Repsol Trading SA*, ¶ 29 (2021) EWHC 2565 (Comm.).

<sup>60</sup> *Curtis v. March*, (1858) 3 Hurl & N 866, 157 ER 719 (Court of Exchequer).

<sup>61</sup> *Id.* at 866.

<sup>62</sup> *Id.* at 867-8.

<sup>63</sup> *See Euronav NV*, *supra* note 59.

<sup>64</sup> *Id.* ¶ 5.

<sup>65</sup> *Id.*

<sup>66</sup> *Id.* ¶ 53.

<sup>67</sup> *Id.* ¶ 35.



(vi) It is inherent in a date-based system that different time zones may apply to the events which define the start and end of the period, if they are in different countries.

...

(viii) If it were appropriate to determine both dates using a single time zone, it would be more logical for that to be the time zone of the place of discharge. As already noted, the completion of discharge is a significant physical event, with a natural date, usually recorded in contemporaneous documents, and with several consequences under the contracts relating to the voyage.<sup>68</sup>

Rules and solutions such as this could become very important as regards the time delay factor. The approach taken here is simply to make time a local concept in these particular transactions. In relation to the making of payments in shipping matters, Henshaw pointed out

Time Charters (7th ed.) states:

It is suggested that, again in the absence of express agreement, the last moment for timely payment should be calculated by reference to the place where payment is to be made so that (for example) a payment to be made in New York and due on 30 April is timely if effected late in the afternoon that day in New York even if the ship is then in the Far East so that for her it is 1 May. (§ 16.22)<sup>69</sup>

It is worth taking into consideration this useful mechanism as regards legal certainty in matters involving deep-space crews. A blanket solution given the time delay factor could—in certain areas—be applied so as to avoid any potential confusion and ensure efficiency. Moreover, less scope for legal argument in such cases is likely to be more beneficial as regards the limitation of costs. It is worth considering whether such a solution could be formulated with respect to the following areas outlined in this article or tendered as a more general solution to the time delay problem overall.

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<sup>68</sup> *Id.* ¶ 61.

<sup>69</sup> *Id.* ¶ 35.

## IV. CONTRACT LAW

Basic principles of contract law underpin a large range of commercial transactions. In English law, for a contract to come into existence, there must generally be a valid offer coupled with a valid acceptance which is supported by consideration and underwritten by the parties' desire to be legally bound by the agreement—commonly known as an intention to create legal relations.<sup>70</sup> The parties must also have the capacity (be old enough) and have a sound mind to enter into the agreement and of sound mind.<sup>71</sup>

On a deep space mission, it is possible that a contract may be formed between a crew member and an Earth-based party. Given the significant amount of media attention that initial ventures will attract, this could be anything ranging from a sponsorship contract to securing the rights to publication of a crew-member story, or negotiations/eventual amendments in pursuit of such ventures. It could also potentially extend to purchasing of property and real estate back on Earth or entering into rental or tenancy agreements with people on Earth, and, least dramatically of all, perhaps, online banking transactions and agreements.

It is also possible that, if it were to offer a significant commercial advantage, a company could desire registration aboard a spacecraft, particularly if engaged in the exploitation of resources on a distant celestial body, asteroid, or other such venture, making those aboard a spacecraft liable for the conclusion or negotiation of contracts regarding any commercial extractions. Associated contractual liabilities could arise even in the absence of any such “registration.”

*A. Communication of Offer and Acceptance*

Regardless of the circumstances contractual liabilities arise in—they could be myriad—the time delay factor outlined previously is likely to have an impact. The old question of when exactly a

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<sup>70</sup> See HUGH BEALE, *CHITTY ON CONTRACTS* 4-207 (35th ed.). See also Ryan Catterwall, *The Limits on Intention in Contract*, 13(9) L.Q.R. 571 (2023). For an interesting case example on contractual intention see the case of *Blue v. Ashley* [2017] EWHC 1928 (Comm).

<sup>71</sup> *Id.* Chapter 12. Regarding minors, see *R. v Oldham Metropolitan BC Exp. Garlick* [1993] 1 F.L.R. 645 (EWCA) at 662. For a case involving mental incapacity see *Imperial Loan Co. v. Stone* [1892] 1 Q.B. 599 (EWCA).

contract has been formed is noteworthy. When an Earth-based entity makes an offer, when does valid acceptance occur? Is it when the crew member speaks the words of acceptance into the microphone/presses “send” on the relevant electronic interface, which signifies assent, or when the words themselves/electronic communication arrives on the Earth 15 minutes later, having been carried on the radio waves? Under the authority of *Brinkibon Ltd v. Stahag Stahl und Stahlwarenhandels-gellschaft mbH*,<sup>72</sup> where instantaneous communications are employed, a contract will be formed in the place where acceptance is received. However, the viability of employing this rule in all circumstances was doubted by Lord Wilberforce:

Since 1955 the use of Telex communication has been greatly expanded, and there are many variants on it. The senders and recipients may not be the principals to the contemplated contract. They may be servants or agents with limited authority. The message may not reach, or be intended to reach, the designated recipient immediately: messages may be sent out of office hours, or at night, with the intention, or on the assumption that they will be read at a later time. There may be some error or default at the recipient's end which prevents receipt at the time contemplated and believed in by the sender. The message may have been sent and/or received through machines operated by third persons. And many other variants may occur. No universal rule can cover all such cases; they must be resolved by reference to the intentions of the parties, by sound business practice and in some cases by a judgement where the risks should lie.<sup>73</sup>

Sound business practice or the law, then, must consider the strange state of contractual limbo which would exist for up to 24 minutes when the words of acceptance would be traveling to Earth on radio waves. Perhaps the clearer analogy to draw in such instances is with acceptance by post in the case of *Adams v. Lindsell*,<sup>74</sup> where, for the sake of commercial certainty, it was held that where post is the desired form of acceptance, acceptance will take

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<sup>72</sup> *Brinkibon Ltd. v. Stahag Stahl und Stahlwarenhandels-gellschaft mbH*, (1983) 2 AC 34 (UKHL).

<sup>73</sup> *Id.* at 42.

<sup>74</sup> *Adams v. Lindsell* (1818) 1 B & Ald 681 (KB).

place on the actual “posting” of the acceptance, and there is no requirement to show that the acceptance has been communicated.<sup>75</sup> Using this analogy, the provider of the radio services and/or high gain antenna would effectively take the position of the post officer—a mere “agent” rather than a party to any such contractual matters.<sup>76</sup> Revocation of an offer by post, on the other hand, is only valid on receipt.<sup>77</sup>

Regarding this inter-temporal period of limbo, Lord Herschell had the following to say:

I think that a person who has made an offer must be considered as continuously making it until he has brought to the knowledge of the person to whom it was made that it is withdrawn. This seems to me to be in accordance with the reasoning of the Court of King’s Bench in the case of *Adams v. Lindsell*.<sup>78</sup>

Taking into account the parameters of the Theory of Special Relativity, it could be said that words of an offer which are carried 24 minutes across the radio waves at the speed of light, in a philosophical sense, have more in common with instantaneous methods of communication since, much like the light received from the sun on planet Earth eight minutes after they depart, the words of the offer relative to the deep space traveler could in one sense be regarded as having arrived contemporaneously with their initial utterance. Accordingly, if this position is taken, the “postal rule” analogy will collapse entirely, and the rules relating to instantaneous communications may apply instead.

It has been held that Fax is a form of instantaneous communication because parties should be able to know—as a matter of fact—whether their communication has been received or not by electronic means.<sup>79</sup> Take Lord Denning’s statement in the seminal case of *Entores Ltd v. Miles Far East Corporation*:

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<sup>75</sup> Brinkibon, *supra* note 72, at 37, (citing *id.*).

<sup>76</sup> Household Fire and Carriage Accident Insurance Co. v. Grant (1879) LR 4 Ex D 216 (KB), per Thesiger LJ.

<sup>77</sup> Byrne & Co v. Van Tienhoven & Co (1880) 5 CPD 344 (Court of Common Pleas).

<sup>78</sup> Henthorn v. Fraser, 31 (1892) 2 ch. 27 (Court of Appeal) at 31.

<sup>79</sup> See JSC Zestafoni Nikoladze Ferroalloy Plant v. Ronly Holdings Ltd. (2004) EWHC 245 (Comm.) at 75.

Lastly take the Telex. Suppose a clerk in a London office taps out on the teleprinter an offer which is immediately recorded on a teleprinter in a Manchester office, and a clerk at that end taps out an acceptance. If the line goes dead in the middle of the sentence of acceptance, the teleprinter motor will stop. There is then obviously no contract. The clerk at Manchester must get through again and send his complete sentence. But it may happen that the line does not go dead, yet the message does not get through to London. Thus the clerk at Manchester may tap out his message of acceptance and it will not be recorded in London because the ink at the London end fails or something of that kind. In that case the Manchester clerk will not know of the failure but the London clerk will know of it and will immediately send back a message "not receiving". Then, when the fault is rectified, the Manchester clerk will repeat his message. Only then is there a contract. If he does not repeat it, there is no contract. It is not until his message is received that the contract is complete.<sup>80</sup>

It is quite pertinent to note that Lord Denning went on to suggest that:

In a matter of this kind, however, it is very important that the countries of the world should have the same rule. I find that most of the European countries have substantially the same rule as that I have stated. Indeed they apply it to contracts by post as well as instantaneous communications. But in the United States of America it appears as if instantaneous communications are treated in the same way as postal communications. In view of this divergence, I think we must consider the matter on principle; and so considered, I have come to the view I have stated, and I am glad to see that Professor Winfield in this country (55 *Law Quarterly Review* at p 514) and Professor Williston in the United States of America (*Contracts* I S 82) takes the same view.<sup>81</sup>

Such a unified approach would be useful for deep-space scenarios. It has also, however, been theorized in the academic literature that Earth-based email communication is not necessarily a form of instantaneous communication either:

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<sup>80</sup> *Entores Ltd v. Miles Far East Corporation* (1955) 2 All ER 493, at 495.

<sup>81</sup> *Id.* at 496.

The speed of email messages depends, in these cases, on whether one or more of these service providers are busy with millions of applications from other internet users. Considerable delays may occur in email communication between when a message is sent and when it is received by the recipient. These delays result from the complex path over which the email is sent. For example, if person A in Aberdeen sends an email message to person B in Belfast, usually there will be no direct link between the computer systems. This explains why, on occasion, an email takes a longer time than usual to reach the recipient... To this end, it can be said that email is not an instantaneous form of communication, because as explained previously, there can be gap in time between dispatch and deemed receipt.<sup>82</sup>

How “instantaneous” any form of communication needs to be before it is “truly instantaneous” does not appear to have been the subject of any significant judicial scrutiny. It is worth noting the authors further comments on the postal rule and the position that the rule could be valuable in the sense that it at least promotes legal certainty:

In fact, it can be said that this rule is efficacious as it is cognizant of both of the business convenience of the offeree and the fair allocation of risk, as it establishes a finite date for the contract and avoids circular communication. (Watnick, 2004) Any delay which occurs between sending and receiving post letters creates potential risk for both of parties due to the uncertainty as to precisely when the message is deemed to have been received. This justification may be considered as the corner stone for application of the postal acceptance rule. Relying on contract formation in posting or dispatch, established a definite time for confirmations between parties if they ask for it, without any need for further communications. This can be understood as Treitel (1991) concludes that “courts in applying the postal rule aim to bring a rationale of necessity and predict that if the contract were to come into force it can best be achieved on sending the acceptance.”<sup>83</sup>

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<sup>82</sup> Marwan Al Ibrahim et al., *The Postal Acceptance Rule in the Digital Age*, 2 J. INT'L COM. L. & TECH. 47 (2007).

<sup>83</sup> *Id.*

By way of a brief comparative exercise, it is interesting to note that in Germany, it is stated that an offer which has been made in the absence of the parties—or inter absentes—“may be accepted only up to the point in time at which the person making the request may expect the receipt of the reply under regular circumstances.”<sup>84</sup>

Moreover, regarding a late acceptance, the German position—rather logically—states that “[l]ate acceptance of an application shall be deemed to be a new application.”<sup>85</sup>

Clearly such an approach may be difficult to reconcile with issues of time delay as technically there would always be a “late acceptance” and that deep space travel would not be classed as “regular” circumstances.

Furthermore, looking to the international stage, the Vienna Convention on Contracts for the International Sale of Goods states:

Article 18 (2)—An acceptance of an offer becomes effective at the moment the indication of assent reaches the offeror. An acceptance is not effective if the indication of assent does not reach the offeror within the time he has fixed or, if no time is fixed, within a reasonable time, due account being taken of the circumstances of the transaction, including the rapidity of the means of communication employed by the offeror. An oral offer must be accepted immediately unless the circumstances indicate otherwise.<sup>86</sup>

This would appear to be a sensible approach to take overall as regards deep space transactions as account must be taken of the transactional circumstances and “rapidity of the means of communication employed by the offeror” as stated.

Two further instructive instruments to observe in this context are the United Nation’s Convention on the Use of Electronic

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<sup>84</sup> Bürgerliches Gesetzbuch [BGB] [Civil Code], §147 ¶2.

<sup>85</sup> *Id.*

<sup>86</sup> Vienna Convention on Contracts for the International Sale of Goods art. 18(2), Apr. 11, 1980, S. Treaty Doc. No. 98-9, 1489 U.N.T.S. 3 [hereinafter Convention on Contracts for Int’l Sale].

Communications in International Contracts,<sup>87</sup> and the UNCITRAL Model Law on Electronic Commerce.<sup>88</sup>

Article 10 of the Convention states, regarding dispatch and receipt of electronic communications pursuant to contractual relations generally:

1. The time of dispatch of an electronic communication is the time when it leaves an information system under the control of the originator or of the party who sent it on behalf of the originator or, if the electronic communication has not left an information system under the control of the originator or of the party who sent it on behalf of the originator, the time when the electronic communication is received.<sup>89</sup>

2. The time of receipt of an electronic communication is the time when it becomes capable of being retrieved by the addressee at an electronic address designated by the addressee. The time of receipt of an electronic communication at another electronic address of the addressee is the time when it becomes capable of being retrieved by the addressee at that address and the addressee becomes aware that the electronic communication has been sent to that address. An electronic communication is presumed to be capable of being retrieved by the addressee when it reaches the addressee's electronic address.<sup>90</sup>

This approach is mirrored in Article 15 of the UNCITRAL Model Law. These instruments make interesting reference to the time of receipt under which the actual deemed time of receipt will be that of the time the communication becomes capable of being retrieved by the party in receipt. In the case of deep space interaction this would be a helpful clarification as regards offer and acceptance in both directions and, coupled with influences from Article 18 of the Vienna Convention on Contracts for the International Sale of Goods, in particular a reference to the "rapidity of the means of

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<sup>87</sup> Convention on the Use of Electronic Communications in International Contracts, art. 10, Nov. 23, 2005, 2898 U.N.T.S. 3 [hereinafter Convention on the Use of Electronic].

<sup>88</sup> U.N. Commission on Int'l Trade Law, Model Law on Electronic Com., art. 10, (June 12, 1996), available at: [https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/19-04970\\_ebook.pdf](https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/19-04970_ebook.pdf).

<sup>89</sup> Convention on the Use of Electronic, *supra* note 87, art. 10(1).

<sup>90</sup> *Id.* at art. 10(2).



communication,” would be a useful device when considering the nuances of offer and acceptance within such circumstances.

One further area in terms of contractual acceptance which could be adversely impacted by time delay would be the situation regarding revocation of an offer, in particular, the situation as regards how much time must have elapsed to make an offer no longer open to acceptance. The classic English authority on this point is *Ramsgate Victoria Hotel v. Montefiore*,<sup>91</sup> which concerned the purchase of shares. The general rule in English contract law is that what constitutes a reasonable amount of time before an offer becomes technically revoked is dependent on the subject matter.<sup>92</sup> In this case, a period of six months had elapsed between the offer being made and the prospective purchase of the shares and the Court determined that the offer was no longer capable of being accepted.<sup>93</sup> The need for certainty as regards such contractual dealings has been mentioned in the literature,<sup>94</sup> and is obvious to discern fluctuations in the value of currencies and the value of shares for example.

In our deep space scenario consider the purchase of shares. Could it be argued that up to 24 minutes could be considered a “long” time for the sake of share purchases? Consider an offer from an Earth-based entity for the purchase of 200 shares at the rate of \$10 per share. Twenty-four minutes later the value of the shares may have increased to \$100 per share. Would the offer still stand in these circumstances, or would it be deemed to have become extinguished through lapse of time? It may be that any such dealings in respect of potentially volatile subject matters between Earth-based entities and deep space travelers must be conducted solely on Earth through a representative vested with power of attorney or some other such authority. At the very least, such transactions will necessarily be subject to a form of caveat acknowledging the time delay and potentially outlining an acceptable “margin of fluctuation” by which the transaction would fail to be determined. As an example of such caveat might be: “on the basis of any given time

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<sup>91</sup> *Ramsgate Victoria Hotel v. Montefiore*, (1866) LR 1 Ex 109 (Court of Exchequer).

<sup>92</sup> See BEALE, *supra* note 70, at 4-127.

<sup>93</sup> *Ramsgate Victoria Hotel v. Montefiore*, *supra* note 91, at 111.

<sup>94</sup> Office of Fair Trading, *Unfair Contract Terms Guidance*, 61 ¶ 14.1.5 (Sept. 2008) <https://assets.publishing.service.gov.uk/media/5a7c7f43ed915d48c241023b/oft311.pdf>.

delay, this offer will become void if the subject matter has fluctuated by up to and including X% at the time of receipt.”

Communication of revocation may also prove problematic here too. As the Vienna Convention on the International Sale of Goods states under Article 15(2), “[a]n offer, even if it is irrevocable, may be withdrawn if the...withdrawal reaches the offeree before or at the same time as the offer.”<sup>95</sup> Owing to the principles of Special Relativity this would be virtually impossible.

There are various approaches to matters of contractual formation in general as can be seen from the forgoing. Given the potential for contractual transactions to arise during a deep space mission it is of paramount importance that the law in this regard is agreed upon prior to departure. This is more pertinent for multinational crews considering that different legal systems will deal with such matters in different ways. Further comparative law research in this area would be useful to determine the different approaches to this conundrum globally from which inspiration could be drawn as regards suitable rules to incorporate regarding any time delay factors in respect of contractual formation and other factors.

### *B. Contracts Where Time Is “of the Essence”*

Related to the discussion of how time is to be described in general earlier in this article, contracts where time is stipulated to be “of the essence”<sup>96</sup> will surely have to be considered in a new light or be drafted in such a way as to factor in respect for the time factor issue. For example, the case of *Union Eagle Ltd. v. Golden Achievement Ltd.*,<sup>97</sup> concerned a 10-minute delay in the payment of a purchase price for a flat and parking space in Hong Kong.<sup>98</sup> The consequence of the delay was that the prospective purchaser lost their deposit on the property.<sup>99</sup> They sued for specific performance.<sup>100</sup> It was held that, since “time was of the essence” with respect to the contract in question, the equitable remedy of specific performance

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<sup>95</sup> Convention on Contracts for Int'l Sale, *supra* note 86, at art. 15(2).

<sup>96</sup> See *Union Eagle Ltd. v. Golden Achievement Ltd.*, [1997] UKPC 5 (Privy Council).

<sup>97</sup> *Id.*

<sup>98</sup> *Id.* ¶ 2.

<sup>99</sup> *Id.* ¶ 1.

<sup>100</sup> *Id.* ¶ 2.

was not available.<sup>101</sup> Certainty in such transactions was held to be of vital importance and, therefore, the consequence of the default stood. As the Court outlined:

No objectionable uncertainty is created by the existence of a restitutionary form of relief against forfeiture, which gives the court a discretion to order repayment of all or part of the retained money. But the right to rescind the contract, though it involves termination of the purchaser's equitable interest, stands upon a rather different footing. Its purpose is, upon breach of an essential term, to restore to the vendor his freedom to deal with his land as he pleases. In a rising market, such a right may be valuable but volatile. Their Lordships think that in such circumstances a vendor should be able to know with reasonable certainty whether he may resell the land or not.<sup>102</sup>

In English law there are various kinds of "time clause," as Sir Terence Etherington stated in *Urban 1 (Blonk Street) Ltd. v. Ayres*.<sup>103</sup> Expressions such as "a response must be received by 1200 Earth/Mars / "Deep Space" Time" may become common-place in certain future boilerplate agreements between spacefarers and Earth-based entities. Some degree of certainty is then needed as regards the time delay factor in such matters.

As previously speculated, it is likely that any substantial dealings as to property between crewmembers and Earth-based entities will be actioned through intermediate documents or deposits required prior to certain completion dates or deadlines in the case of sale of land are most likely to be delivered by an Earth-based agent of the crew-member. Assuming that one common legal transaction which is likely to be required by crewmembers will be payment of monies—for whatever purpose—it is worth noting that § 10(1) of the Sale of Goods Act 1979 states that stipulations about time in

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<sup>101</sup> *Id.* ¶ 3.

<sup>102</sup> See *Union Eagle, supra* note 96, ¶ 12.

<sup>103</sup> *Urb. 1 (Blonk Street) Ltd. v. Ayres*, [2014] 1 WLR 756 (High Court), ¶ 12 ("(1) It is necessary to distinguish between three types of contractual time provision. They are those which are conditions in the technical sense that any breach of them, however slight, is a repudiatory breach of contract which entitles the other party to terminate the contract immediately; those which are warranties in the technical sense that any breach of them, however serious, will only ever entitle the other party to damages and not to terminate the contract; and those which are so-called innominate terms . . .").

the case of payments are “not of the essence” unless the contract states otherwise.<sup>104</sup> Whether this provision has parallels in other jurisdictions will ultimately remain to be seen but, essentially, this would appear to be a sensible position to adopt regarding deep space transactions. However, such an adoption should be tempered so as to include reference to the likely time delay impact.

Even in the absence of any such explicit term being inserted in such contracts, including where time is “of the essence,” under English law it is probable that a term would be implied in relation to time delay in this regard. Implied terms can be implied in fact,<sup>105</sup> as well as law.<sup>106</sup> Terms implied in fact are terms that are implied to give business efficacy to the contract or those which both parties would consider obvious.<sup>107</sup> Such a test could effectively produce the outcome that, in circumstances involving time delay, it would be “obvious” that both parties would take this into account but where would this leave a contract where time is stipulated to be “of the essence”? Would an implied term as to being mindful of time delay have the effect of overruling an express term as to time being of the essence?

As has been shown, a time delay factor could have wide-reaching implications for a range of transactions where the legal foundations are largely shaped by principles of contract law. The presenting issues, however, are not insurmountable. Different jurisdictions deal with these matters in different ways and the international instruments examined show how approaches can be tailored to new developments—electronic commerce, for instance. A useful exercise going forward in this area would be a comprehensive comparative study of a range of legal systems in areas of basic contractual formation to determine the most appropriate way forward.

## VI. TORT LAW

Contract law is not the only area likely to suffer complications because of time delay. Aspects of tort law and criminal law could also be affected by this phenomenon.

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<sup>104</sup> 1979 c. 54, S10(1).

<sup>105</sup> *The Moorcock*, [1889] 14 PD 64 (App. Ct.).

<sup>106</sup> *Liverpool City Council v. Irwin*, [1976] UKHL 1.

<sup>107</sup> *See generally*, *The Moorcock*, *supra* note 105.

As described by Winfield, “[t]ortious liability arises from the breach of a duty primarily fixed by the law; such duty is towards persons generally and its breach is redressable by an action for unliquidated damages.”<sup>108</sup> A cornerstone of tort law is the law of negligence, which this section will largely concern itself with. The seminal case of *Donoghue v. Stevenson* is the most revered touchstone for the modern law of negligence in the UK.<sup>109</sup> In particular, statement of Lord Atkin is held to have shaped the modern definition:

The rule that you are to love your neighbour becomes in law, you must not injure your neighbour; and the lawyer’s question, Who is my neighbour? receives a restricted reply. You must take reasonable care to avoid acts or omissions which you can reasonably foresee would be likely to injure your neighbour. Who, then, in law is my neighbour? The answer seems to be - persons who are so closely and directly affected by my act that I ought reasonably to have them in contemplation as being so affected when I am directing my mind to the acts or omissions which are called in question.<sup>110</sup>

The modern law of negligence in the UK has been refined by various judicial statements since this case. For the purposes of this article the most important areas are that of the “standard” of care—judged by the standard of the “reasonable person.”<sup>111</sup> This standard was summarized by Lord MacMillan:

The standard of foresight of the reasonable man is, in one sense, an impersonal test. It eliminates the personal equation and is independent of the idiosyncrasies of the particular person whose conduct is in question. Some persons are by nature unduly timorous and imagine every path beset with lions. Others, of more robust temperament, fail to foresee or nonchalantly disregard even the most obvious dangers. The reasonable man is presumed to be free both from over-apprehension and from over-confidence, but there is a sense in which the standard of care of the reasonable man involves in its application a subjective element. It is still left to the judge to decide

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<sup>108</sup> PERCY H. WINFIELD, *THE PROVINCE OF THE LAW OF TORT* 32 (1931).

<sup>109</sup> *Donoghue v. Stevenson*, [1932] A.C. 562 (HL).

<sup>110</sup> *Id.* at 580.

<sup>111</sup> *See Muis v. Glasgow Corp.* (1943) A.C. 448 (H L).

what, in the circumstances of the particular case, the reasonable man would have had in contemplation, and what, accordingly, the party sought to be made liable ought to have foreseen.<sup>112</sup>

The standard of care is thus variable and will sometimes depend on the capacity in which the defendant was acting at the time of the alleged negligence. Lord Denning described the standard of care for road users in the case of *Nettleship v. Weston*:

The learner driver may be doing his best, but his incompetent best is not good enough. He must drive in as good a manner as a driver of skill, experience and care, who is sound in mind and limb, who makes no errors of judgment, has good eyesight and hearing, and is free from any infirmity.<sup>113</sup>

Likewise, for those exercising a specific skill, this standard was famously announced by McNair, J. in the case of *Bolam v. Friern Hospital Management Committee*:<sup>114</sup>

In the ordinary case which does not involve any special skill, negligence in law means a failure to do some act which a reasonable man in the circumstances would do, or the doing of some act which a reasonable man in the circumstances would not do; and if that failure or the doing of that act results in injury, then there is a cause of action. How do you test whether this act or failure is negligent? In an ordinary case it is generally said you judge it by the action of the man in the street. He is the ordinary man. In one case it has been said you judge it by the conduct of the man on the top of a Clapham omnibus. He is the ordinary man. But where you get a situation which involves the use of some special skill or competence, then the test as to whether there has been negligence or not is not the test of the man on the top of a Clapham omnibus, because he has not got this special skill. The test is the standard of the ordinary skilled man exercising and professing to have that special skill. A man need not possess the highest expert skill; it is well established law that it is sufficient if he exercises the

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<sup>112</sup> *Id.*

<sup>113</sup> *Nettleship v. Weston*, (1971) 2 Q.B. 691, 699.

<sup>114</sup> *Bolam v. Friern Hosp. Mgmt. Comm.* (1957) 1 W.L.R. 582 (Q.B.).

ordinary skill of an ordinary competent man exercising that particular art.<sup>115</sup>

Professionals are held to a higher standard of care as regards negligent acts in appropriate circumstances. Relevant standards are all tempered by what is known as “reasonable foreseeability.” As Viscount Simonds stated in *Overseas Tankship (UK) Ltd. v. Morts Dock & Engineering Co. (The Wagon Mound)*:

For it does not seem consonant with current ideas of justice or morality that for an act of negligence, however slight or venial, which results in some trivial foreseeable damage the actor should be liable for all consequences however unforeseeable and however grave, so long as they can be said to be “direct.” It is a principle of civil liability, subject only to qualifications which have no present relevance, that a man must be considered to be responsible for the probable consequences of his act. To demand more of him is too harsh a rule, to demand less is to ignore that civilised order requires the observance of a minimum standard of behaviour.<sup>116</sup>

Regarding the intersection of reasonable foreseeability and the standard of care expected of professionals, time delay could be a significant variable in such matters. Suppose that the time delay between Earth and Mars is 20 minutes at the time of a specific medical problem which none of the crew members on Mars are qualified to deal with—it may be a situation where the crew's doctor needs to seek a second opinion. When a medical expert on Earth issues any advice in response to a question, the advice may not necessarily be suitable to the patient's condition after the 20 minutes the advice takes to be carried by the radio waves to Mars. The patient's situation may have deteriorated—or improved—or other symptoms may have manifested themselves. Should the advice be acted upon by the doctor on Mars in such an instance? Would they be negligent for doing so or would the medical expert on Earth be negligent for not qualifying their advice with reference to the given time delay? While this may seem like a mere practical consideration it would be one that is certainly worth considering in a legal sense.

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<sup>115</sup> *Id.* at 586.

<sup>116</sup> *Overseas Tankship Ltd. V. Morts Dock & Engineering Co.*, (1961) A.C. 388 (P.C.) at 422-23.

Similar issues could arise in respect of other professional communications. Economic loss caused by a negligently made statement is also part of the law of tort.<sup>117</sup> The legal basis for imposing liability was laid down by Lord Denning in *Hedley Byrne v. Heller and Partners Ltd.*:

A reasonable man, knowing that he was being trusted or that his skill and judgment were being relied on, would, I think, have three courses open to him. He could keep silent or decline to give the information or advice sought: or he could give an answer with a clear qualification that he accepted no responsibility for it or that it was given without that reflection or inquiry which a careful answer would require: or he could simply answer without any such qualification. If he chooses to adopt the last course he must, I think, be held to have accepted some responsibility for his answer being given carefully, or to have accepted a relationship with the inquirer which requires him to exercise such care as the circumstances require.<sup>118</sup>

Consider the situation where there is a 15 minute time delay. If financial advice is given on Earth at 0:00 (midnight) it will arrive with the crew member on Mars at 0:15. Let's assume that something happens in the financial market at around 0:05 which would materially alter the advice given at 0:00 rendering it such that it would cause significant financial loss to the recipient in such circumstances. If the financial adviser does not act and utter a second communication as soon as possible, this could have potentially serious and undesirable consequences for both parties to this discussion, including a potential finding of negligence against the financial adviser. For this reason, any relevant time-sensitive professional advice given will have to be given subject to the impact of time delay. Individuals on Earth acting in an advisory capacity must be keen not to act in breach of any fiduciary duty or common law duty of care. It would be wise for certain contractual relations to contain disclaimers in respect of such instances, particularly where trading may be taking place on a volatile subject matter such as stocks or shares—or even property prices. A further solution—in

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<sup>117</sup> See *Derry v. Peek* (1889) 14 App Case 337 (HL); *Candler v. Crane Christmas & Co.* (1951) 2 KB 164.

<sup>118</sup> *Hedley Byrne v. Heller*, (1964) App. Case 465 (HL) at 486.



respect of markets which could be said to be less volatile and more static—would be for any such communications to be made subject to confirmation in writing after a “cooling-off” period; a Mars based entity could be required to follow up any advice received in writing after—in the case of a 15 minute time delay—no sooner than following the lapse of 15 minutes—to give time for any significant changes to be communicated.

As previously mentioned, agreements could also, in the alternative/additionally, perhaps stipulate an agreed “margin of error” in respect of an acceptable amount of financial loss that could accrue because of a time delay. Such a provision might read, “any acceptance of advice will be rendered null and void in the event of a depreciation of 2% (or greater) during a slower than ordinarily anticipated communication of such an acceptance owing to time delay arising from inter-spatial dislocation of more than 30 seconds.”

Moving beyond the mere financial and advisory sphere, it is important to recall that other aspects of negligence may come into play—between the flight controller and a crew in deep space for instance. Any such instructions or advice from those based on Earth will necessarily be subject to such a delay. For this reason, any instructions or advice will necessarily have to take notice of the time delay factor, effectively adding an extra layer of legal complication to such matters. It would not be ill-advised for legal training in this area to be provided to relevant individuals to reduce any potential uncertainty or, in the alternative, that relevant waivers or disclaimers are signed prior to the commencement of any deep-space mission so that all parties acknowledge the legal risk inherent in such communications.

## VII. CRIMINAL LAW

Although probably less likely to arise in fact than matters of negligence, the criminal law is also worthy of consideration in this overview,<sup>119</sup> particularly since the effects of long duration space travel to other celestial bodies are likely to be unpredictable as regards aspects of human behavior which has been widely

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<sup>119</sup> See Robin McKie, *NASA Astronaut ‘Accessed Ex-Partner’s Bank Account from Space Station*, GUARDIAN, (Aug. 24, 2019). <https://www.theguardian.com/us-news/2019/aug/24/nasa-astronaut-allegedly-accessed-ex-partners-bank-account-while-living-on-iss>,

documented.<sup>120</sup> Infractions of the criminal law between crewmembers in deep space is unlikely to be affected by time delay—save for the potential procedural issues should Earth-based authorities be called upon to resolve any such dispute.<sup>121</sup> However, there are numerous examples of where the spatial dislocation could potentially impact the law between Earth-based entities and crew members. For example, in English law, the common law offence of assault requires that the victim apprehend the infliction of immediate unlawful force—there is no need for physical contact between the defendant and the victim. In *Tuberville v. Savage*,<sup>122</sup> the court held that “[i]f it were not assize-time, I would not take such language from you.” This statement was in respect to the placing of an individual’s hand upon the hilt of their sword was not an assault as the victim would not have apprehended immediate unlawful force—the statement made was to the effect that he would have taken action if it were not for the fact that he would be prosecuted, therefore there was no immediate apprehension of unlawful force. Without considering the time delay factor the fact that in a deep space setting those on Earth would be separated by a great deal of distance from those in deep space means that it is unlikely that such an offence could be made out over the radio waves. However, other similar offences could well arise, including Threats to Kill under Section 16 of the Offences Against the Person Act 1861,<sup>123</sup> which states “[a] person who, without lawful excuse, makes to another a threat, intending that that other would fear it would be carried out, to kill that other or a third person is guilty of an offence.”<sup>124</sup>

For the avoidance of doubt, it has been held that such offenses could be committed through electronic means.<sup>125</sup> In addition, The Malicious Communications Act of 1988 created the offence of

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<sup>120</sup> See George S. Robinson & Jeanne Hughes, *Space Law: The Impact of Synthetic Environments, Malnutrition and Allergies on Civil and Criminal Behaviour of Astronauts*, 19 JURIMETRICS J. 59, 65 (1978); see also ESA Press Release No. 24-1994, The HUBES Experiment: A Ground-based Simulation of a 135-day Manned Spaceflight (Aug. 22, 1994), [https://www.esa.int/Newsroom/Press\\_Releases/The\\_HUBES\\_experiment\\_a\\_ground-based\\_simulation\\_of\\_a\\_135-day\\_manned\\_spaceflight](https://www.esa.int/Newsroom/Press_Releases/The_HUBES_experiment_a_ground-based_simulation_of_a_135-day_manned_spaceflight).

<sup>121</sup> See Alex Simmonds, *In Space the Other Side Should Have the Right to be Heard*, 28 COVENTRY L. J. (2023).

<sup>122</sup> *Tuberville v. Savage*, [1669] 1 Mod Rep 3 (KB).

<sup>123</sup> Offences against the Person Act, 1861, §16.

<sup>124</sup> *Id.*

<sup>125</sup> *R. v. Braithwaite (Duran)* [2012] EWCA Crim 2053.

“sending letters etc. with intent to cause distress or anxiety”<sup>126</sup> which could also be done via electronic means.<sup>127</sup>

Regarding such criminal offences in general, the approach of many common law jurisdictions is to break a criminal offence down into, at its most basic level, an “Actus Reus”—guilty act—and “Mens Rea”—guilty mind. Save for strict liability offences which only require the Actus Reus of the offence,<sup>128</sup> the general proposition is that for a crime to come into existence both the Actus Reus and Mens Rea must coincide. In English law, this point is often illustrated in *Fagan v. Metropolitan Police Commissioner*.<sup>129</sup> In this case, the crime was complete at the time the Actus Reus and Mens Rea came together—when Fagan decided not to remove his car from the policeman’s foot. The Actus Reus was complete as the car was on the police officer’s foot at that moment in time. Fagan formed the Mens Rea when he decided not to remove the car. The Mens Rea and Actus Reus, therefore, overlapped at the same time and a crime came into existence at that instantaneous moment in time. With signals transmitted from Mars it is at least arguable in a philosophical sense, that there is, in fact, no Mens Rea at the time the actual time the harm is caused. With the time delay factor this would mean that any such spoken words as defined under the Malicious Communications Act would have criminal consequences even though they would not be capable of being heard for around 15 minutes. In this respect they would be analogous to postal communications under the Act and present no such legal difficulty. Moreover, there is authority to suggest that Actus Reus and Mens Rea do not necessarily have to be present at the same time for an offence to arise,<sup>130</sup> and the question of whether the harm or injury caused must be contemporaneous with the cross-over between Actus Reus and Mens Rea could be rather moot or philosophical. There are certain offences whereby *prima facie* is not a requirement.<sup>131</sup> It is likely in any case that courts will dispense with any philosophical

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<sup>126</sup> The Malicious Communications Act, § 1 1988 (UK).

<sup>127</sup> *Id.* § 1(2A).

<sup>128</sup> See *Sweet v. Parsley*, [1970] AC 132 (HL); *Gammon (Hong Kong) Ltd. v. Attorney-General of Hong Kong*, [1985] AC 1 (PC).

<sup>129</sup> *Fagan v. Metropolitan Police Commissioner*, [1968] 3 All ER 442 (QB).

<sup>130</sup> See *Attorney General for Northern Ireland v. Gallagher* [1963] A.C. 349, 382 (HL).

<sup>131</sup> See generally Offences Against the Person Act, 1861 (UK), § 31 (setting spring guns with intent to inflict grievous bodily harm).

considerations and take the pragmatic point of view that, in respect of communication and threat-related offences between Earth based entities and those in deep space, that *Mens Rea* and *Actus Reus* both travel at the speed of light once the offence is, according to its place in space time made out vis-à-vis the remote victim.

#### VIII.A PHOTONIC COUNTER ARGUMENT

All of the scenarios in this article involve radio communications of some kind or another. Radio waves have carried details of new laws, offers and acceptance and even criminal or tortious utterances and statements.

Radio waves are themselves, photons. On the basis of Special Relativity,<sup>132</sup> it is widely accepted that photons do not experience time. Therefore, it could be argued that the law, then, does in fact, travel faster than the speed of light—the radio waves that carried the details of the laws or relevant communications at the speed of light themselves did not experience time—and, therefore, neither did the laws or relevant communications being carried!

There are a few counter-arguments against this, however. Firstly, the message as carried by the photons themselves is meaningless until it is given meaning by human perception. In other words, the signal itself does not become intelligible until it is displayed on an interface of some sort or converted into sound-waves. In respect of contractual matters involving offer and acceptance, this would draw some interesting parallels with the postal rule—<sup>133</sup>as here, whilst the letter is in transit there is likewise no way of knowing its contents. At the moment it is so manifested, the law or relevant communication itself is likewise manifested and the time difference between the manifestation of the enactment or communication as communicated from Earth and the meaningful manifestation of the enactment within a craft in deep space, is still present.

Secondly, even if it is accepted that photons move the law instantaneously, the actual date of the enactment being moved instantaneously will still be the date of the enactment as it was manifested on Earth and, therefore, be “time-stamped” between 5 and

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<sup>132</sup> See Einstein, *supra* note 5.

<sup>133</sup> *Adams v. Lindsell* (1818) 1 B & Ald 681 (KB).

22 minutes before the time it actually arrives at the relevant point in deep space.

Thirdly, if it is accepted that the law does not experience time when it is being carried by the photons and that the law is effectively moving faster than the speed of light, this would only be from the frame of reference of the photons themselves.<sup>134</sup> Relative to the frame of reference of the recipient in deep-space there would still be a delay.

### IX. CONCLUSIONS

The time delay factor associated with deep space communications has the potential to cause legal issues across a range of areas. This can be handled in a variety of ways by the relevant legislative authorities.

Firstly, domestic legislatures can amend existing rules in certain key areas—including those outlined in this article—so that they take account of time delay. This is particularly important as regards promulgation of legal instruments—at what stage should such instruments be taken to bind those in deep space? Does the law, in such instances, move faster than the speed of light or should at least a nominal effort be made to inform the relevant crew members ahead of the publication of such instruments? On this point, legislation could be enacted in the guise of the Interpretation Act 1978,<sup>135</sup> whereby all relevant provisions are said to commence at midnight minus the commensurate time associated with time delay for those in deep space—or simply state that, in the cases of travelers in deep space, the enactment comes in on midnight of the day before. This would serve to uphold and maintain the legitimacy of the rule of law in such situations per the words of Hobbes, Fuller, Bingham and countless others since, providing the instrument is published and theoretically accessible ahead of the time of its eventual enactment on Earth, there should be no substantive objections regarding its effectiveness on the basis of non-discoverability.

If it is accepted that the law does indeed move faster than the speed of light, to safeguard its legitimacy, what must happen is that

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<sup>134</sup> Thanks to my student, Polina Myroshnychenko, (First Year English Law, University of Dundee) for this suggestion.

<sup>135</sup> The Interpretation Act, 1978 (UK).

relevant laws in their draft forms must be made accessible to any crew—most likely indirectly via an accessible internet or national websites—ahead of their publication and, just as importantly, crews must be explicitly aware of the fact that laws enacted on Earth at midnight will bind them from midnight at Earth time onwards regardless of any associated time delay.

Adopting the same approach, as that outlined in the Joint Service Manual,<sup>136</sup> regarding the laws of war, whereby means of analogy to action taken by forces in ignorance of an armistice is one possible solution or would be judging each incidence of “ignorance of the law” on a case-by-case basis appears to have been the usual practice in common law jurisdictions with the rule not appearing quite as cut and dry as may have been expected. Regardless of which approach may be the most suitable, at least a “soft law” arrangement on such matters would be highly desirable ahead of any such mission in future.

Turning away from the specific matter of time delay momentarily, regarding legality itself there are questions as to enforcement which will require an element of consideration. One of the (unsuccessful) arguments raised in the case of *Christian v. The Queen* was that because there was no police force or means of enforcing the relevant law on the Pitcairn Islands, that the law ceased to be law. As stated by Oliver, “this raises significant questions for philosophers and anthropologists as to the actual nature and meaning of ‘law’ if it is not accompanied by any enforcement provisions, whether formal or social.”<sup>137</sup>

Regarding solutions to the live issue of time delay, it is wise to consider other practical solutions. Should deep space travellers be subject to a form of blanket legal liability insurance provided for by the mission operators covering all Civil Liability as was once proposed?<sup>138</sup> Whilst this may appeal to a sense of convenience and legal certainty, it breaks down on closer examination. Firstly, why should these individuals be above the law? Secondly, should an Earth-based individual or entity commit a legal wrong against the

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<sup>136</sup> See *Union Eagle*, *supra* note 96.

<sup>137</sup> DAWN OLIVER, JUSTICE, LEGALITY AND THE RULE OF LAW: LESSONS FROM THE PITCAIRN PROSECUTIONS 13 (2009).

<sup>138</sup> U.S. Congress, Office of Tech. Assessment, *Space Stations and the Law: Selected Legal Issues-Background Paper*, OTA-BP-ISC-41 (Aug. 1986).

interests of any of these individuals— such as breaching a contract—some form of legal framework must be engaged in order to resolve any such dispute. Would the blanket immunity solution be compatible with this idea? It is worth pointing out that, potentially, a legal dispute could arise between a crew member and another individual based anywhere on Earth—it goes without saying that different legal systems will approach different legal problems in different ways.

Although it is perhaps impossible to theorize every single substantive legal matter which could potentially be impacted by time delay, it is certainly possible to theorize potential solutions which may help to offset at least some of the more likely problems. One possibility would be for all legal transactions between crew members on board a deep space mission and Earth-based entities are to go through a fictional “Time Filter”—there should be a rule established by multinational agreement that, regardless of which jurisdictions law should take precedence, by implication, all legal transactions between Earth-based entities and crew members must automatically account for time-delay factors. One way of managing this arrangement could be to designate deep space missions as being within a particular legal “zone” as regards legal disputes once they cross a certain pre-determined threshold vis-a-vis time delay. Once a spacecraft crosses into this zone, it becomes subject to a form of “Deep Space Common Legal Framework.” For example, once the ship reaches the threshold where a 1-minute time delay arises in terms of communications between the crew and all Earth-based entities, all legal disputes/transactions vis-a-vis the Crew—and any Earth-based entity—are resolved under the framework or at least made subject to it where relevant. The question of what a “reasonable” period delay would be for legal purposes under this would in and of itself be an avenue for future academic discussion.

Although it would be impossible to list all the potential areas that could be impacted by time delay, several basic general principles could certainly be considered ahead of time. Before the content/form of any such filter or framework is agreed, however, it may be pertinent for a more general discussion of the nature of legal transactions in the context of the Special Theory of Relativity; when, in law, is intention or a state of mind formed? When it is formed on Mars—which, in some cases, would effectively be 20

minutes into the past—or when evidence of such intention reaches Earth in the present? To make practical sense of such matters, the precise time that a material event happens on Mars should be converted to Earth time and vice-versa for evidential purposes—“Earth” time—whichever time zone that is deemed to be—will have to be timestamped and aligned with “Mars” time—whichever time zone that happens to be in on Mars should such a requirement arise.

Future beneficial research in this area could involve comparative studies of a range of the world’s legal systems to determine an optimal approach to time delay in particular areas, particularly those most likely to arise. From this very brief survey of potential matters arising, there are certain areas which will be impacted by time delay. There must be some consideration as how best to counter such issues ahead of any crewed deep space voyages. It is worth considering for a moment, possible blanket measures to combat the time delay factor and whether these are feasible if not desirable.

Regarding matters of promulgation, the framework could specify that any Earth-based legal enactments which serve to bind any crew members as citizens of that country, are only deemed to bind such crew members once the relevant time delay has cleared. For example, an enactment on Earth with a commencement time and date of midnight on 1 January 2035 would bind those operating under the framework at 12:15 AM on the 1 January 2035 should the applicable time delay happen to be 15 minutes. This would avoid a lot of the potential issues with promulgation and publication as previously outlined.<sup>139</sup>

Moreover, contractual dealings—such as those associated with volatile subject matters such as shares as in *Ramsgate Victoria Hotel v. Montefiore*<sup>140</sup>—could operate under the *caveat emptor* principle; those making a contractual offer regarding any volatile subject

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<sup>139</sup> An alternative solution could be to broadcast the new legislation to a deep space crew ahead of time so that the new legislation arrives with the crew on the scheduled commencement date. For example, if the new legislation is set to come into force at midnight on a given day, and the time delay between Earth and the crew in deep space is calculated to be 20 minutes, the new legislation could be broadcast from Earth to the crew 20 minutes prior at 11:40 PM so that it arrives with the crew at midnight. This would then coincide with the time that the legislation comes into force on Earth. This solution was proposed by my space law student, Billy Westhead, and could be henceforth referred to as the ‘Westhead Formula’.

<sup>140</sup> See *Ramsgate Victoria Hotel*, *supra* note 91.



matter liable to fluctuate markedly in value would be deemed to be on notice regarding the time delay factor which would therefore become part of the risk of the overall transaction. Pre-existing contractual and other arrangements would need to be “grandfathered” into the framework under some other legal mechanism, the kind of which is outside the scope of this article.

Furthermore, a comparative study of all relevant national legislation which time delay could potentially impact along with prominent international “soft law” instruments—as has been carried out to a lesser extent here—would be a very beneficial exercise for the purpose of uncovering any latent problems which could arise ahead of time. Although “deep space” travel in the context of this article could be decades away, it is the anticipatory function of law in this context which may assist in circumnavigating some potentially awkward legal complications.

While, first and foremost, any proposed legal solutions here are put forward for the sake of upholding legality and the rule of law, a highly important secondary effect will be to reduce levels of uncertainty amongst crew members within an already highly stressful and isolated environment as regards their legal position vis-à-vis Earth-based entities and authorities hopefully serving to streamline the process for any legal disputes arising. In this sense, attention to the law could be regarded as “mission critical.”

# BACK TO THE FUTURE OF “BIOPOWER”: FOUCAULT’S PRESCRIPTIONS AND THE REGULATION OF COMMERCIAL ORDER AND DISCORDANCE IN OUTER SPACE

*Gbenga Oduntan\**

## ABSTRACT

This article applies Foucault’s ideas on Power—specifically biopower as a tool to explain sovereignty, jurisdiction and control over persons in outer space. This approach will hopefully illuminate the general nature and essence of “statist” regulation of outer space activities. The author believes that Foucault’s analysis of biopower—a tool of critical law scholarship—can help to forensically explain the governing dynamics of the jurisdiction *ratione personae* exercised by States in outer space under the modern Westphalian model of sovereignty. The approach will also aid in prescribing sustainable and progressive policy directions for national regulatory agencies in space. Foucauldian approaches would help reveal both the considerable strengths and, of course, the limitations and perhaps inequities of national regulation in space. This exercise will also hopefully indicate quite clearly why networks of international agencies and private corporations ought not be able to displace core aspects of statist manifestation of regulatory power in outer space. The article attempts to free jurisdiction from its semantic legalese in space law and make it encompass philosophy, sociology and jurisprudential influences

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while at the same time restricting the exploitative purposes to which both jurisdiction and biopower can be pressed in outer space.

“Power is everywhere...”

-M. Foucault (1976)<sup>1</sup>

## I. INTRODUCTION

This article applies Michel Foucault’s ideas on Power—specifically biopower as a tool to explain sovereignty, jurisdiction and control over persons in outer space. This approach will hopefully illuminate the general nature and essence of “statist” regulation of outer space activities. I believe that Foucault’s analysis of biopower—a tool of critical law scholarship—can help to forensically explain the governing dynamics of the jurisdiction *ratione personae* exercised by States in outer space under the modern Westphalian model of sovereignty. The approach will also aid in prescribing sustainable and progressive policy directions for national regulatory agencies in space. Foucauldian approaches would help reveal both the considerable strengths and of course, the limitations and perhaps inequities of national regulation in space. This exercise will also hopefully indicate quite clearly why networks of international agencies and private corporations ought not be able to displace core aspects of statist manifestation of regulatory power in outer space. Thus, even as it appears that globalization as a process has eroded Westphalian State models of regulation, the big issues of our day in space, in as much as they are international, cross border, highly technical and fast moving still needs to obey very familiar patterns of traditional national power. Foucault’s biopower has not, to my understanding been used in analysing topics in space law. My treatment here will therefore be novel and hopefully useful in generating solutions and new thinking relating to national regulation of privatisation and sustainability in space activities.

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<sup>1</sup> MICHEL FOUCAULT, *THE HISTORY OF SEXUALITY: THE WILL TO KNOWLEDGE* 93 (1976).

Around the early 1970s, Foucault—a sociologist—began to write in concentrated manner on the connection between power and knowledge and how this shapes criminal law, crime medicine and social discourses generally.<sup>2</sup> His forays into law were mostly limited to penal inquiry and municipal law. Thus, space law was certainly not an interest of this scholar. However, whether Foucault envisaged it or not, legal scholars among other disciplines have been attracted to his ideas. Scholars of his work have indeed noted that his prescriptions invite intellectuals working in a multiplicity of networks and disciplines to participate in specific struggles and engage in concrete actions based on his ideas.<sup>3</sup> The argument pursued in this article is that biopower as a concept is quite suitable as an analytical tool to explain State control over businesses and commercialism just as much as it does explain State power over astronauts, space tourists, the operation of space instrumentation, space vehicles, space stations and asteroid mining operations.

Indeed, the immediate role of biopower as a concept in space as used in this article will not be in the sense of its use in relation to humans in a direct, physical, criminological or policing manner. It will only relate to that in reference to its ultimate uses and potentialities. The interpretation I am deliberately interrogating will be in the form of an inquiry into the role and competences of biopower as an explanation of the exercise of control over both corporate and natural persons in their commercial engagements in outer space. Biopower is both suitable to explain the direct power of discipline and control over the bodies of personnel and astronauts as it is in sanctioning and compelling the types of arrangements of commercial conduct in space. I believe that this is where the frictions that determine the use of biopower will lie over the course of this century and beyond. This is why my analysis is decidedly concentrated on the larger intellectual or philosophical manifestations of biopower rather than its traditional policing or physical usage. For biopower to be useful in this century it must be able to encapsulate the larger interpretations of the concept. It can and it must account for the conceptual ability of national laws to describe, prescribe, and enforce the State's "policing powers" in both

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<sup>2</sup> Gerald Turkel, *Michel Foucault: Law, Power, and Knowledge*, 17 J. L. & Soc'y 170, 170 (1990).

<sup>3</sup> *Id.* at 178.

its physical senses and consequently in its civil, corporate and commercial senses. This is continuously important in this era in which States' regulatory powers are now being extended by many countries into the entirety of outer space and for all outer space activities. It is within this sphere of wider, more holistic analysis that biopower presents its best contemporary utility in outer space law and regulation today.

My methodology will be Foucauldian by default but the article will also involve comparative law and the use of certain choice comparators (e.g., foreign jurisdictions and sub-areas of legal issues). The research question and strategy will be framed within interdisciplinarity.<sup>4</sup> The scope of enquiry of this article will thus only tangentially include both discussions of power relations between States and actual criminal jurisdiction over human beings that are not related to economic and commercial order. In essence our scope is limited to the relevance of the concept of biopower to the commercial philosophy behind the contents of emerging national legislation such as the United Kingdom (UK) Space Industry Act (2018),<sup>5</sup> the United States (US) Commercial Space Launch Competitiveness Act (2015)<sup>6</sup> and the Luxembourg law of July 20th, 2017.<sup>7</sup> In other words, what sort of commerce have States chosen to allow or police in space and for what reasons? The US and Luxembourg jurisdictions are selected for discussion here as examples of jurisdictions where a controversial stance has been taken on space exploitation for mineral resources. The UK, however, provides an alternative and less gung-ho commercial philosophy of space regulation in the exercise of its biopower and jurisdiction. The omission and avoidance of the grant of powers of mineral resource exploitation in outer space national regulation by the UK, even as its national laws provides wide powers on private persons in space activities, is a significant exercise of its State sovereignty. The scope of the enquiry will also include references to

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<sup>4</sup> For further information regarding this methodology, *see generally* PETER DE CRUZ, *COMPARATIVE LAW IN A CHANGING WORLD* (3d ed. 2007).

<sup>5</sup> Space Industry Act 2018, ch. 5 (U.K.).

<sup>6</sup> U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90 (2015) codified as amended in scattered sections of 51 U.S.C.). *See* 51 U.S.C. § 513; 51 U.S.C. § 10101 (2015); 51 U.S.C. § 51303.

<sup>7</sup> Law on the exploration and utilization of space resources (hereafter Luxembourg Space Resources Law).

the significance of biopower in the regulatory environment created by new players in outer space from the developing world such as Nigeria and South Africa. The hope is to arrive at a tighter, more convincing explanation for State jurisdiction over commercial space activities. This approach will vindicate the primacy of biopower over deregulation in outer space activities. It will also indicate the imperatives for mainstreaming sustainability into (a) the commercial uses of outer space and (b) the progressive privatization of outer space activities.

## II: TOUR DE FORCE OF THE LEX COMMUNIS SPATIALIS AND THE EMERGING SCOPE OF NATIONAL REGULATORY ENVIRONMENT

Before I can apply the jurisprudence of biopower to national space regulation I need to deconstruct even if very briefly the essence of international space law. The law governing outer space has developed at a relatively fast pace as an aspect of public international law, yet it determines the commercial and economic uses and value of outer space. These include space transportation, telecommunications, manufacturing, experimentation, real estate, tourism, and mining. The treaty system that governs outer space consists of the five United Nations “originating” treaties on outer space and the five declarations and legal principles.

The so called five ‘originating’ treaties on outer space are:

- (a) Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (1967)<sup>8</sup> (Outer Space Treaty or OST);
- (b) Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (1968)<sup>9</sup> (Rescue Agreement);

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<sup>8</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 UST. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

<sup>9</sup> Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Apr. 22, 1968, 19 UST. 7570, 672 U.N.T.S. 119 [hereinafter Rescue Agreement].

- (c) Convention on International Liability for Damage caused by space Objects (1972)<sup>10</sup> (Liability Convention);
- (d) Convention on Registration of Objects Launched into Outer Space (1975)<sup>11</sup> (Registration Convention);
- (e) Agreement Governing the Activities of States on the Moon and other Celestial Bodies (1979)<sup>12</sup> (Moon Agreement).

The five declarations and legal principles are:

Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (1963);<sup>13</sup>

The Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (1982);<sup>14</sup>

The Principles Relating to Remote Sensing of the Earth from Outer Space (1986);<sup>15</sup>

The Principles Relevant to the Use of Nuclear Power Sources in Outer Space (1992);<sup>16</sup>

The Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (1996).<sup>17</sup>

Note may also be taken of the Space Debris Mitigation Guidelines (2007).<sup>18</sup> While not a declaration in the traditional

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<sup>10</sup> Convention on the International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 UST. 2389, 961 U.N.T.S. 187 [hereinafter *Liability Convention*].

<sup>11</sup> Convention on Registration of Objects Launched into Outer Space, Jan. 14, 1975, 28 UST. 695, 1023 U.N.T.S. 15 [hereinafter *Registration Convention*].

<sup>12</sup> Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1362 U.N.T.S. 3 [hereinafter *Moon Agreement*].

<sup>13</sup> G.A. Res. 1962 (XVIII).

<sup>14</sup> G.A. Res. 37/92 (Dec. 10, 1982) [hereinafter *DBS Principles*].

<sup>15</sup> G.A. Res. 41/65 (Dec. 3, 1986).

<sup>16</sup> G.A. Res. 47/68 (Dec. 14, 1992).

<sup>17</sup> G.A. Res. 51/122 (Feb. 4, 1997).

<sup>18</sup> Comm. on the Peaceful Uses of Outer Space, Rep. Of the Scientific and Tech. Sub-comm. On its Forty-Fourth Session, U.N. Doc. A/AC.105/890, para. 99, and Annex 4.

sense, these guidelines, developed by the UN Committee on the Peaceful Uses of Outer Space (COPUOS), help to regulate space debris and ensure the sustainable use of outer space. The originating treaties establish the principal aims and objectives of international space laws such as the common interest of all humankind in the progress of the exploration and use of outer space for peaceful purposes, and for the benefit of all peoples irrespective of the degree of their economic or scientific development.<sup>19</sup> The treaties contribute to broad international cooperation in scientific as well as legal aspects and the strengthening of friendly relations between States and peoples. States must refrain from placing in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction or from installing such weapons on celestial bodies.<sup>20</sup> They condemn propaganda designed, or likely to, provoke or encourage any threat to the peace, breach of the peace or act of aggression through outer space.<sup>21</sup> The Limited Test Ban Treaty 1963 for instance, helped to put an end to the armaments race and eliminated the incentive for the production and testing of all kinds of weapons, including nuclear weapons in space, discontinuance of all test explosions of nuclear weapons in space for all time, attempting to put an end to the contamination of humanity's environment by radioactive substances.<sup>22</sup> The implications of these provisions arguably are the permissiveness of detonations of a non-nuclear nature such as those pertaining to conventional, biological, chemical, or high energy laser weapons. The provisions may prohibit the use of nuclear fission as a means of space propulsion and prohibits the use of nuclear explosions for non-testing purposes as well. The emergent international legal regime for space recognizes the common interest of all humankind in the progress of the exploration and use of outer space for peaceful purposes.<sup>23</sup> The exploration and use of outer space by treaty agreement is to be carried on for the betterment of humankind and for the benefit of all States irrespective of their degree of economic

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<sup>19</sup> See Rosanna Deplano, *Inclusive Space Law: The Concept of Benefit Sharing In The Outer Space Treaty*, 72 *Int'l & Compar. L. Q.* 671, 681 (2023).

<sup>20</sup> Outer Space Treaty, *supra* note 8, art. IV.

<sup>21</sup> See *id.* at art. I-III, IX, X, XII, XIII.

<sup>22</sup> See *id.* at art. I & II.

<sup>23</sup> *Id.* at art. I, V & Preamble.



or scientific development.<sup>24</sup> The appetite of States in most of the international space instruments particularly the 1962 and 1997 resolutions is that there should be broad international co-operation in the scientific as well as in the legal aspects of exploration and that the use of outer space should be for peaceful purposes.<sup>25</sup> States have also resolved to use space exploration for the development of mutual understanding and strengthening of friendly relations between nations and peoples.<sup>26</sup> States condemned propaganda designed to provoke or encourage any threat to the peace, breach of the peace, or act of aggression in outer space.<sup>27</sup> Activities in the field of international direct television broadcasting by satellite should be conducted in accordance with international law, including the Charter of the United Nations.<sup>28</sup> At any rate States bear international responsibility for activities in the field of international direct television broadcasting by satellite carried out by them or under their jurisdiction and for the conformity of any such activities requisite principles set forth in space treaties.<sup>29</sup> Indeed when international direct television broadcasting by satellite is carried out by an international intergovernmental organization, the responsibility referred to above should be borne both by that organization and by the States participating in it.<sup>30</sup> The particular importance of "the province of [hu]mankind"<sup>31</sup> and

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<sup>24</sup> G.A. Res. 1962 (XVIII), at preamble & ¶¶ 1-4 (Dec. 13, 1963) [hereinafter Declaration of Legal Principles].

<sup>25</sup> *Id.*, G.A. Res 51/122 (Feb. 4, 1997).

<sup>26</sup> *Id.*

<sup>27</sup> Declaration of Legal Principles, *supra* note 24, at preamble.

<sup>28</sup> DBS Principles, *supra* note 14.

<sup>29</sup> *Id.*

<sup>30</sup> *Id.* ¶¶ 1, 4, 8, 9.

<sup>31</sup> The "Province of [Hu]mankind" principle, found in the language of the 1967 Outer Space Treaty, asserts that outer space, including the Moon and other celestial bodies, is free for exploration and use by all countries. For all intents and purposes, the drafters used the terms to emphasize that space is not to be subject to territorial claims or sovereignty, and that no states can be allowed to appropriate any part of outer space for any appreciable exclusive ownership, use or control. This principle underlines the "global commons" status of outer space and safeguarding its benefits for all of humanity. Another aspect of the understanding developed around this terminology and provision is that activities in space must be conducted for peaceful purposes. Scholars from developing States and their official delegations have traditionally equated the "province of [hu]mankind" provision to the CHM principle. Following the adoption of the Outer Space Treaty, the Legal Subcommittee of the Committee on Peaceful Uses of Outer Space (COPUOS) stressed that one of the Treaty's underlying bases was to be the existence of

“Common Heritage of [Hu]mankind (CHM)”<sup>32</sup> principles must be highlighted.

From a national regulatory perspective it is important to note that international law and space instruments impose international responsibility upon States for national activities in outer space, whether carried on by governmental agencies or by non-governmental entities.<sup>33</sup> The activities of non-governmental entities in outer space shall require authorization and continuing supervision by the State concerned.<sup>34</sup> When activities are carried on in outer space by an international organization, responsibility shall be borne by the international organization and by the States

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a "common property" in the outer space milieu. See Bradley Larschan & Bonnie C. Brennan, *Common Heritage of Mankind Principle in International Law*, 21 COLUM. J. TRANSNAT'L L. 327 (1983). Another is that the benefits of space exploration should be shared equitably among all nations, particularly to enhance the welfare of humankind. See Motolani Fadahunsi-Banjo, *Extending the International Law Principle of Good Neighborliness to Outer Space*, 58 PROC. INT'L INST. SPACE L. 211, 212, 216 (2015). See also Gbenga Oduntan, *Imagine There Are No Possessions: Legal and Moral Basis of the Common Heritage Principle in Space Law* in KOEN DE FEYTER, GLOBALIZATION AND COMMON RESPONSIBILITIES OF STATES 259-287 (2017).

<sup>32</sup> Article 11 of the Moon Agreement (1979) provides that “the Moon Treaty and its natural resources are the common heritage of [hu]mankind, which finds its expression in the provisions of this Agreement.” This for most scholars is considered to be a stronger statement of communal property rights than the language contained within the Outer Space Treaty, as the “province of all [hu]mankind.” See Thomas Cheney, *There's No Rush: Developing a Legal Framework for Space Resource Activities*, 43 J. SPACE L. 106, 110 (2019). The Common Heritage of Mankind (CHM) in the space law context is a principle that applies to celestial bodies, such as the Moon and other planets, designating them as resources to be used for the benefit of all humanity. It emphasizes non-appropriation, equitable sharing of benefits, peaceful use, and international cooperation in exploration and exploitation. This principle was codified in the Moon Agreement (1979) but remains less widely accepted compared to other space treaties. If a comparison is to be made between both principles being discussed here it is possible to argue that the province of mankind principle, declares that outer space, including the Moon, is to be maintained free for exploration and use by all States without discrimination, National sovereignty claims are also forbidden in that context. The CHM principle on the other hand requires collective management and benefit-sharing of space and its resources. The province of mankind principle in a sense allows freer use while emphasizing inclusivity and peaceful purposes. Together, both principles undoubtedly reinforce the notion that outer space is a global commons to be used responsibly for the benefit of humanity. See KEMAL BASLAR, THE CONCEPT OF THE COMMON HERITAGE OF MANKIND IN INTERNATIONAL LAW (2024).

<sup>33</sup> Outer Space Treaty, *supra* note 8, art. VI.

<sup>34</sup> *Id.*

participating in it.<sup>35</sup> (Art. 5 Declaration of Legal Principles); s. 9 Direct Television Broadcasting (1982). It may be argued that is an indication of the determination of the drafters of space treaties that States ultimately retain sovereign control over commercialization of outer space and use of its resources.

In the exploration and use of outer space, States shall be guided by the principle of cooperation and mutual assistance and States are expected to have due regard for the corresponding interests of other States.<sup>36</sup> States are expected to undertake appropriate international consultations before proceeding with any activity or experiment if there is reason to believe that an outer space activity or experiment would cause potentially harmful interference with activities of other States.<sup>37</sup> Again, it may be argued that these provisions are incompatible with space weaponization.

The power to retain full jurisdiction and control over space objects is assured under the provisions that the State on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and any personnel thereon.<sup>38</sup> Ownership of objects launched into outer space, and of their component parts, is indeed not affected by their passage through outer space or by their return to the earth. Objects found shall be returned to the registered State Party.<sup>39</sup>

While the existing United Nations treaties and principles on outer space provide the fundamental legal architecture for space law they also form the basis for a number of important guidelines for space activities. In essence we have to consider the impact of the development of softer mechanisms such as the Artemis Accords,<sup>40</sup> and the Guidelines for the Long-term Sustainability of Outer Space Activities.<sup>41</sup> These soft laws along with their older, more mature,

<sup>35</sup> Declaration of Legal Principles, *supra* note 24, ¶ 5; DBS Principles, *supra* note 14, ¶ 9.

<sup>36</sup> Outer Space Treaty, *supra* note 8, art. IX

<sup>37</sup> *Id.*

<sup>38</sup> *Id.* at art. VIII.

<sup>39</sup> *Id.* See also Rescue Agreement, *supra* note 9.

<sup>40</sup> The Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids, NASA, <https://www.nasa.gov/wp-content/uploads/2022/11/Artemis-Accords-signed-13Oct2020.pdf> [hereinafter Artemis Accords].

<sup>41</sup> Comm. on the Peaceful Uses of Outer Space, Rep. of the Comm. on Its Sixty-Second Session, Annex II, U.N. Doc A/74/20 (2019) [hereinafter LTS Guidelines].

legal cousin instruments all relate to Foucauldian principles to the extent that they ought to inform States in their national regulations and regulatory behavior. As a United Nations Resolution, the LTS Guidelines are voluntary and not legally binding under international law, but any action taken towards their implementation should be consistent with the applicable principles and norms of international law. The LTS Guidelines are formulated in the spirit of enhancing the practice of States and international organizations in applying the relevant principles and norms of international law.<sup>42</sup> The challenges before the entire international system as a result of unsustainable space activities are described thus:

The Earth's orbital space environment constitutes a finite resource that is being used by an increasing number of States, international intergovernmental organizations and non-governmental entities. The proliferation of space debris, the increasing complexity of space operations, the emergence of large constellations and the increased risks of collision and interference with the operation of space objects may affect the long-term sustainability of space activities. Addressing these developments and risks requires international cooperation by States and international intergovernmental organizations to avoid harm to the space environment and the safety of space operations.<sup>43</sup>

It is suggested that the first place to begin to address these risks would be through national regulation which is also the natural domain of the exercise of biopower as I point out in discussions below. The regulation of the engagement of private enterprise from the nation State, mostly by the State authorities and now increasingly in conjunction with the private entrepreneurs and corporate structures as well as other international actors under international law, are all crucial in achieving sustainable order and avoiding discordance on core issues in outer space.

For instance, the meaningful discharge of the obligations under the Artemis Accord among those States signed up to it will require a sociological conditioning of elite systems in those

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<sup>42</sup> *Id.* ¶¶ 2 & 3.

<sup>43</sup> *Id.* ¶ 1.

respective States to align themselves with important principles as an aspect of the exercise biopower. The requisite obligations move seamlessly from possible criminal prohibitions to torts and civil standards and other pure commercial considerations and policies. Matters requiring sociological indoctrination which even commercial ventures must abide by include: transparency in the broad dissemination of information regarding national space policies and space exploration plans; the development of interoperable and common exploration; infrastructure and standards, registration of space objects, release of scientific data, preserving outer space heritage and the utilization of space resources for the benefit of humankind.<sup>44</sup> Again it is arguable that the United Nations Guidelines for the Long-term Sustainability of Outer Space Activities adopted by the COPUOS in 2019, by implication, requires nation States to exercise biopower in its holistic sense in favour of progressive regulation.

It is possible that the existing constellation of treaties, declarations and soft laws will in time be complemented by further directions from new treaties. For instance, there is much hope for a new Commercial Outer Space Treaty (COST) the proposal of which may include a space competition/antitrust framework, with a governance model that facilitates the commercial aspects of the new space economy.<sup>45</sup>

*A. The UK Regulatory Environment as a Case in Point.*

For illustrative purposes we ought to examine at least one national jurisdiction to see the development of its national regulatory environment. The history of contribution to space law and development of regulatory bodies in the UK space sector is a long and chequered one. The initial stages of engagement are in the form of the UK's representation and participation in the foundational era of international cooperation (1957-1967). This was primarily in the form of space law making through treaties and agreements and the UK's establishment of domestic policies. The UK was an active participant in the drafting of the Outer Space Treaty (1967), which

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<sup>44</sup> See Artemis Accords, *supra* note 40, § 3, 4, 5, 7, 8, 10& 11.

<sup>45</sup> See generally Maria Lucas-Rhimbassen, *The COST of Joining Legal Forces on a Celestial Body of Law and Beyond*, 59 SPACE POL'Y 101445 (2022).

established fundamental principles for space exploration, such as the prohibition of national sovereignty claims and the commitment to peaceful use.<sup>46</sup> The early treaties in many ways marked the UK's formal entry into the regulation of space activities through international law.<sup>47</sup>

In the 1980s the government instructed the Space Division of the Department of Trade and Industry to establish an ad hoc committee to assess how UK space activities and to determine how the sector should be organised and make recommendations.<sup>48</sup> This committee was essentially replaced by the British National Space Centre (BNSC), a government organisation in charge of coordinating space policy, in 1985.<sup>49</sup> The UK became a member of the European Space Agency (ESA) in 1973 but as space activities became more complex and diverse, the need for a dedicated regulatory framework became evident. This led to the formation of the United Kingdom Space Agency (UKSA) which took over the role of the BNSC on April 1, 2010.<sup>50</sup> The Civil Aviation Authority (CAA) assumed leadership as the United Kingdom's space regulator in July 2021.<sup>51</sup> The Space Industry Act of 2018 (SIA),<sup>52</sup> the Space

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<sup>46</sup> Mark Horn, *Critical Analysis from an International Law Perspective of the United Kingdom's Regulatory Framework of Space and High-Altitude Activities in the Context of Changing Technology and Evolving Geopolitical Tensions*, 20-39 (thesis, University of Lincoln, 2023) [https://repository.lincoln.ac.uk/articles/thesis/Critical\\_analysis\\_from\\_an\\_international\\_law\\_perspective\\_of\\_the\\_United\\_Kingdom\\_s\\_regulatory\\_framework\\_of\\_Space\\_and\\_High-Altitude\\_Activities\\_in\\_the\\_context\\_of\\_changing\\_technology\\_and\\_evolutionary\\_geopolitical\\_tensions\\_/24874542?file=43767792](https://repository.lincoln.ac.uk/articles/thesis/Critical_analysis_from_an_international_law_perspective_of_the_United_Kingdom_s_regulatory_framework_of_Space_and_High-Altitude_Activities_in_the_context_of_changing_technology_and_evolutionary_geopolitical_tensions_/24874542?file=43767792).

<sup>47</sup> See generally Christopher J. Newman, *Space Law & Policy: The U.K. Approach to the Regulation of Space Activities*, Oxford Research Encyclopedia of Planetary Science (Mar. 23, 2022) <https://oxfordre.com/planetaryscience/display/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-37>; Douglas Millard, *An Overview of United Kingdom Space Activity 1957-1987* (Apr. 2005), [https://www.esa.int/esapub/hsr/HSR\\_36.pdf](https://www.esa.int/esapub/hsr/HSR_36.pdf).

<sup>48</sup> Joanne Wheeler, *In Review: Space Law, Regulation and Policy in United Kingdom*, <https://www.lexology.com/library/detail.aspx?g=ae61ea3b-c17c-4c60-8a7c-2364f7b60f1c>.

<sup>49</sup> *The BNSC*, PARLIAMENT.UK, <https://publications.parliament.uk/pa/cm200607/cmselect/cmsctech/66/6606.htm> (last visited Dec. 21, 2023).

<sup>50</sup> Jonathan Amos, *'Muscular' UK Space Agency Launched*, BBC NEWS (Mar. 23, 2010), <http://news.bbc.co.uk/2/hi/8579270.stm>.

<sup>51</sup> *CAA Becomes UK Space Regulator and Launches Licensing Regime*, U.K. CIVIL AVIATION AUTHORITY, (July 29, 2021) <https://www.caa.co.uk/newsroom/news/caa-becomes-uk-space-regulator-and-launches-licensing-regime/> (last visited Dec. 15 2023).

<sup>52</sup> Space Industry Act 2018, c. 5 (UK).

Industry (Environmental Impact Assessment) Regulations 2021<sup>53</sup> and the Outer Space Act of 1986 (OSA)<sup>54</sup> provide the regulatory provisions including licensing regimes for various aspects of space activities. The CAA has since granted a license for a space port in Cornwall.<sup>55</sup>

The UK National Space Strategy issued in September 2021 combines civil and defence policy, and outlines the UK government's goals for the country's space operations.<sup>56</sup> The incorporation of national economy, military defence and the promotion of national values into a single national space strategy can be seen in both the National Space Strategy (2021) and the Defence Space Strategy (2022).<sup>57</sup> The Scottish Space Strategy was also instituted in October 2021.<sup>58</sup> The United Kingdom has committed itself to investing £1.4 billion over the next 10 years in developing cutting-edge space technology with military and civilian applications.<sup>59</sup> The National Space Strategy therefore, competently outlines the United Kingdom's strategic priorities in outer space and its higher grounds.

Within the UK space strategy there is a hierarchical stratification of governance. At the top of the hierarchy is the National Space Council which overlooks space policies, defence

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<sup>53</sup> Space Industry (Environmental Impact Assessment) Regulations 2021, SI 2021/792 (UK). These regulations came into force as part of the UK's commitment to secure environmental protection and sustainable development in the space industry. They establish requirements for assessing and managing the environmental impact of space activities, particularly in relation to significant activities related to spaceports and launch operations.

<sup>54</sup> Outer Space Act UK Public General Acts 1986 (c. 38).

<sup>55</sup> Jeff Foust, *Spaceport Cornwall Receives First U.K. Spaceport License*, SPACENEWS (Nov. 17, 2022), <https://spacenews.com/spaceport-cornwall-receives-first-u-k-spaceport-license/>.

<sup>56</sup> Policy Paper from the U.K. Space Agency, *National Space Strategy* (Feb. 1, 2022) <https://www.gov.uk/government/publications/national-space-strategy/national-space-strategy>.

<sup>57</sup> Policy Paper from the U.K. Ministry of Defence, *Defence Space Strategy: Operationalising the Space Domain*, (Feb. 1, 2022) <https://www.gov.uk/government/publications/defence-space-strategy-operationalising-the-space-domain>.

<sup>58</sup> *Scottish Space Strategy Launched*, SCOTTISH GOV'T, (Oct. 20, 2021) <https://www.gov.scot/news/scottish-space-strategy-launched/>

<sup>59</sup> Press Release, U.K. Ministry of Defence and Defence Science and Technology Laboratory, *UK Cutting-edge Space Defence Backed by £1.4 Billion* (Feb. 1, 2022) <https://www.gov.uk/government/news/uk-cutting-edge-space-defence-backed-by-14-billion>.

space strategy, and cross-domain integration by the Ministry of Defence (MOD), BEIS and other government agencies.<sup>60</sup> These bodies overlook the activities of the UK space command, UK strategic command, Air Command, and the UK space agency and together they regulate policies patterning to capability management, force generation, and space operation.<sup>61</sup>

Thus, the national regulation of space programmes and activities are taken very seriously and there has been a clear intention to facilitate commercial growth of the space industries. However, it is very important to note that the UK has also been moving towards the philosophy of self-regulation in the space industries. In this way the UK Space Agency and technocratic collectives are making substantial impact in establishing crucial norms and advancing best practises.<sup>62</sup> A great variety of initiatives even in the high-tech area of space innovation can be associated with self- and co-regulation. These will in time include voluntary programmes, certification schemes and Codes of Conduct, with varying degrees of government involvement.<sup>63</sup> This development will also have to be accounted for within the remit of the inquiry

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<sup>60</sup> See generally Lesley Jane Smith, Alan Thompson & Nicholas Beach, *The United Kingdom in Space: A New Era: Outlook on Latest Regulatory Developments and the UK Space Community*, 46 AIR AND SPACE LAW, 713-738 (2012).

<sup>61</sup> *Defence Space Strategy: Operationalising the Space Domain*, U.K. MINISTRY OF DEFENCE (Feb. 2022) [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/1051456/20220120-UK\\_Defence\\_Space\\_Strategy\\_Feb\\_22.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1051456/20220120-UK_Defence_Space_Strategy_Feb_22.pdf).

<sup>62</sup> For instance, nine Catapults, have been established to transform the UK's capability for innovation in specific areas and to help drive future economic growth. Corporate bodies like the Satellite Applications Catapult are designed and operated to bring together multi-disciplinary teams to generate ideas and solutions for space activities in an open innovation environment. They target and exploit the innovation potential in the UK industrial and academic communities by being a focal point where small and medium enterprises, large industries, and end users can work together with researchers to challenge barriers, explore and develop new ideas, and bring these to commercial reality. See *About Us*, CATAPULT SATELLITE APPLICATIONS, <https://sa.catapult.org.uk/about-us/>. (last visited Dec. 21, 2023).

<sup>63</sup> Kate McEntaggart et al., *Designing Self- and Co-Regulation Initiatives: Evidence on Best Practices*, U.K. DEP'T. BUS. ENERGY & INDUS. STRAT. (BEIS), at 4 (2019), [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/840564/designing-self-co-regulation-initiatives.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/840564/designing-self-co-regulation-initiatives.pdf); Press Release, BEIS et al., Bold New Strategy to Fuel UK's World-class Space Sector (Sept. 27 2021), <https://www.gov.uk/government/news/bold-new-strategy-to-fuel-uks-world-class-space-sector>.



below relating to the exercise of sovereign and jurisdictional powers in space.

### III. A FOUCAULDIAN ANALYSIS OF THE BIOPOWER OF STATES IN THE SCENARIOS OF OUTER SPACE.

From the discussion thus far it is clear that the expectations of international law on States to maintain order in space and to prevent discordance on core activities are great. To effectively discharge these tasks States must understand the basis of their powers and jurisdiction in all their essential features. Twining was essentially correct when he concluded that “there are some jobs for jurisprudence.”<sup>64</sup> The basis for understanding, manifesting and understanding State competences in space at this stage of international life must be all encompassing and must admit other extralegal and sociolegal concepts like Foucault’s biopower.<sup>65</sup> Foucault—a French philosopher and professor on the history of systems of thought who lived between 1926 and 1984—was a poststructuralist. His postulations illuminate useful social science constructs including power, governmentality and biopolitics. His writings have had particular impact on the theory of power; how power circulates and how it is exercised. This is very relevant for space law where we are looking to understand significant shifts in sovereignty and governance over the last 60 years. In particular Foucault’s governmentality lenses will allow contemporary space lawyers, regulators and businessmen to understand trends in regulatory governance within sociological and historical contexts.<sup>66</sup> The political power and economic interests of States is exercised today through a multitude of agencies, techniques and corporates

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<sup>64</sup> William Twining, *Some Jobs for Jurisprudence*, 1 BRIT. J. L. & SOC’Y 149, 149 (1974).

<sup>65</sup> As Twining explains until recent decades legal jurists have been confined to a narrow range of concepts. Recently however and happily there has been a change and welcome development with an increasing number of scholars applying “rigour and clarity in the general style of modern analytical philosophers” and have turned their attention to concepts that are not so much legal concepts to solve legal problems. Twining correctly narrowed the arrowhead of this development in Britain to legal curriculum and scholarship “characterised by the programmes at Kent and Warwick, developments in criminology and penology and, more recently, interest in the sociology of law and so-called ‘socio-legal studies.’” *Id.* at 149, 163, 171-73.

<sup>66</sup> Peter Miller & Nikolas Rose, *Governing Economic Life*, 19 ECON. & SOC’Y 1, 4 (1990).

some of which are only loosely associated with the executives and bureaucracies of the formal organs of the State.<sup>67</sup> How and why is outer space regulated at the national level? How does regulation function towards a self fulfilling prophesy of commercialisation and exploitation in outer space? What scope is there for private regulation in relation to outer space. What dangers lurk in the near distance for the environment and sustainability? These are all necessary posers that Foucauldian approaches are very suitable for in providing answers, particularly in outer space. This is because contemporary governmentality accords a crucial role to 'government at a distance' and where best to study 'government at a distance' than in relation to space activities?

#### A. *Biopower in Time and Space.*

"Biopower" is a neologism Foucault. Foucault's concept of biopower describes the administration and regulation of human life at the level of the individual body and the population.<sup>68</sup> Its concern is the exercise of suzerainty and power over the human population.<sup>69</sup> The scope of biopower encompasses the general practices of public health, regulation of heredity, and risk regulation, among many other regulatory mechanisms. Biopower is manifested in the practice of modern States and in their regulation of subjects. Foucault correctly saw biopower as a means of controlling, organizing, or otherwise governing large groups of people by placing limitations on their actions and inactions.<sup>70</sup> As Foucault saw it, biopower is a practice in modern States used to organize society and control the people within it by means of "an explosion of numerous and diverse techniques for achieving the subjugations of bodies and the control of populations."<sup>71</sup> It can be said that Foucault saw biopower as a means of controlling, organizing, or otherwise governing large groups of people by placing

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<sup>67</sup> *Id.* at 1, 2 & 14.

<sup>68</sup> See generally Vernon W. Cisney & Nicolae Morar, *Biopower: Foucault and Beyond*, available at <https://cupola.gettysburg.edu/cgi/viewcontent.cgi?article=1090&context=books>.

<sup>69</sup> Alisdair Rogers et al., *DICTIONARY OF HUMAN GEOGRAPHY*, "Biopolitics" (2013).

<sup>70</sup> IAN BUCHANAN, *A DICTIONARY OF CRITICAL THEORY*, "Biopower" (2d ed. 2018). See generally MICHEL FOUCAULT, *BEYOND STRUCTURALISM AND HERMENEUTICS* (2d ed. 1983); FOUCAULT, *supra* note 1.

<sup>71</sup> *BIOPOLITICS AND UTOPIA 1* (Andrew Byers & Patricia Stapleton eds., 2015).

limitations and controls on their bodies (hence the “bio” in biopower) through leading them to believe certain ways to think and act are consistent with the truth.

These questions of organisation and control are today being applied to persons on space crafts and space stations. More importantly such questions are already cropping up in relation to planned communities of humans in space as for instance, in relation to Mars or in response to the interests of States in mining asteroids.<sup>72</sup> Another example of this is when Luxembourg one of the smallest States on Earth projects biopower on its nationals by stating in its principal Space Act that no person or corporate operator can explore or use space resources without holding a written mission authorisation from the minister or ministers in charge of the economy and space activities.<sup>73</sup> It needs also be said that the Luxembourg regime provides a general space law framework for the country. The need to study the manifestations of power in space is already a matter of practical importance. Foucault himself often stated a belief that the purpose of discussing power is not to use it as a theory or a methodology but to use it as a way to create a history of the different modes by which, human beings are made subjects.<sup>74</sup> In other words it does not matter where in spatial terms human beings are made subjects of power, the principles ought to apply in similar verifiable terms.

Foucault’s analysis, in his treatise *Security, Territory, Population*,<sup>75</sup> is relevant to the appreciation of human activities in space whether these take place on spacecraft, floating space stations, or in the context of future planetary stations and colonies. His thinking offers a new set of tools and analyses for all those who dare to shine his intellectual thoughts into the darkness of deep space. For space stations his ideas are particularly cogent. Foucault famously explored the emergence of “bio-power” and the “techniques of security” as means of shaping and regulating populations from a distance.<sup>76</sup> Without intention to do so, Foucault

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<sup>72</sup> Caleb Ohmer, *When Galaxies Collide: Resolving Criminal Justice Disputes Among Nations*, 43 J. SPACE L. 344, 345-46 (2019).

<sup>73</sup> Space Industry Act, *supra* note 5, arts 2 & 4.

<sup>74</sup> Michel Foucault, *The Subject and Power*, 8 CRITICAL INQUIRY 777, 778 (1982).

<sup>75</sup> MICHEL FOUCAULT, *SECURITY, TERRITORY, POPULATION: LECTURES AT THE COLLÈGE DE FRANCE 1977-1978* (Michel Senellart et al., eds., 2009).

<sup>76</sup> *Id.* at 36.

provides a basis for us to understand how deeply embedded (in spatial terms) national power relations are to the project of humankind. In determining the pervasiveness of biopower and its centrality to the State he also exposes the inevitability of clashes and conflicts of power in space. States' biopower in space is manifested in their power over their crews on space craft and also in their competence to draw up rules of shared biopower on occasions such as in relation to astronauts on the International Space Station (ISS). Examples of these are found in the detailed civil and criminal jurisdiction powers retained by all the State parties to both the 1988<sup>77</sup> and 1998<sup>78</sup> Inter Governmental Agreements (IGA). These unique arguments established the overall cooperative framework for the design, development, operation and utilization of the ISS. In essence all States retained jurisdiction over their nationals up to the distance of 254 miles above the Earth's surface. The language of the commitments arguably shows that this retention of power is both an end itself and a means to the other ends of the scientific missions of the astronauts in outer space.

Biopower is inherently productive and spurs economic benefits by its successful prescriptions of order. In his lectures on Security, Territory, Population Foucault explains that biopower is used to enforce discipline—crowd control, occupations and executions.<sup>79</sup> Those that can engage in the occupation of space activities within and from the UK are painstakingly identified in legislation. The power to arrest persons for offences against the safety of spacecrafts and space facilities generally is expressed in several sections of the Space Industry Act (2018).<sup>80</sup> Juridical biopower can be subtractive

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<sup>77</sup> Agreement among the United States of America, governments of Member States of the European Space Agency, the government of Japan, and the government of Canada on Cooperation in the Detailed Design, Development, Operation, and Utilization of the permanently Manned Civil Space Station, Sept. 29, 1988 [hereinafter IGA 1988], [https://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle\\_query?1990ESASP.305..147.&defaultprint=YES&filetype=.pdf](https://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle_query?1990ESASP.305..147.&defaultprint=YES&filetype=.pdf).

<sup>78</sup> The International Space Station Intergovernmental Agreement, Jan. 29, 1998, T.I.A.S. 12927 [hereinafter IGA 1998]; see generally Rochus Moenter, *The International Space Station: Legal Framework and Current Status*, 64 *J. Air L. & Com.* 1033 (1999) (for more discussion on these agreements).

<sup>79</sup> GARY GUTTING, *FOUCAULT: A VERY SHORT INTRODUCTION* 79-90 (1st ed. 2005).

<sup>80</sup> See Space Industry Act § 22, sch. 4 (offences against the safety of spacecraft such as destroying, damaging or endangering safety of spacecraft; other acts endangering or

such as the removal of the power of drivers to speed in municipal situations and similar safety prescriptions are now identifiable in sections 19 to 21 of the Space Industry Act (2018).<sup>81</sup> The right to discipline personnel and the whole competences of the State in criminal law and under the field of criminology is a natural byproduct of biopower. These important powers are now exported into space via key civil and criminal laws in Sections 51 to 58.<sup>82</sup> Biopower increases the chances of the State in successfully exercising its criminal powers through preventative measures. Ultimately therefore, UK legislation like those of several other States that have bothered to legislate space laws have transferred human order into the darkness of space much along the lines of the divine declaration “let there be light.”

Yet potentially the most impressive achievement of biopower could be its utility and contributions to the economic interests of States. The discipline biopower enforces everywhere is utilitarian. Foucault wrote:

Discipline, of course, analyzes and breaks down; it breaks down individuals, places, time, movements, actions, and operations. It breaks them down into components such that they can be seen, on the one hand, and modified on the other...discipline classifies the components thus identified according to definite objectives. What are the best actions for achieving a particular result: What is the best movement for loading one’s rifle, what is the best position to take? What workers are best suited for a particular task?<sup>83</sup>

Biopower is the basis of enforcement of discipline which is in itself a core aspect of the expression of biopower. Without the concept of power there is no biopower and without biopower there can be no discipline. Discipline is correctly conceptualised by Foucault as “essentially centripetal.”<sup>84</sup> There are however, aspects

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likely to endanger safety of spacecraft; endangering safety at spaceports; offences in relation to possessing certain dangerous articles on board a UK space craft or at a UK space Launch facility).

<sup>81</sup> *See id.* §§ 19-21 (these provisions cover safety regulations (§ 19); investigation of accidents (§ 20) assistance with performance of regulator’s safety functions (§ 21)).

<sup>82</sup> *See id.* §§ 52-59.

<sup>83</sup> FOUCAULT, *supra* note 75, at 56-57.

<sup>84</sup> *Id.* at 44-45.

of Foucault's theory that may need updating. He correctly claims that "discipline functions to the extent that it isolates a space, that it determines a segment."<sup>85</sup> He however, did not appear to explain how the biopower of States interact with each other beyond those spaces and when in contact or how biopower operates in the grey zones of contact. Outer space however, is the ultimate grey zone in so many ways. Furthermore Foucault's juxtaposition and attempted contradistinction between discipline and security as aspects of power is unconvincing. This is probably again because he apparently was not examining power in spatial terms even though he constantly refers to space. He believes that:

The first action of discipline is in fact to circumscribe a space in which its power and the mechanisms of its power will function fully and without limit...In contrast, you can see that the apparatuses of security, as I have tried to reconstruct them, have the constant tendency to expand; they are centrifugal. Hence Security therefore involves organizing, or anyway allowing the development of ever-wider circuits.<sup>86</sup>

I am however, of the view that both discipline and security are capable of expanding into the eternity of the universe in spatial terms. Foucault was of course not considering this in his many treatises. It is important to rescue biopower from its disciplinary confines because its sociological functions are needed to make States assume a disciplinary function on behalf of humankind in policing particularly the activities of private enterprise in outer space. We must now point to the nexus between the disciplinary powers of the State and the projection of its economic interests as well as the way it interacts with the *lex mercatoria* practiced by the mercantile classes.

*B. Biopower and its Relations to Jurisdiction and its Useful  
Twins: Jurisfaction and Jurisaction.*

Biopower appears to be an innovative sociological tool of analysis but it is also in alignment with the ideas of lawyers like Bin Cheng—widely regarded as one of the fathers of space law in

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<sup>85</sup> *Id.* at 66.

<sup>86</sup> *Id.*

the UK. Cheng introduced two unique binary terminologies in the 1960s, to expatiate upon the doctrine of jurisdiction. Biopower itself rests on jurisdiction as there can be no biopower without jurisdiction. Cheng suggested that State jurisdiction as a whole, may be separated into two complementary elements:

- (a) Jurisdiction to prescribe (prescriptive legislative jurisdiction or *jurisdiction*) and
- (b) Enforcement prerogative jurisdiction or *jurisdiction* (that is jurisdiction to enforce).<sup>87</sup>

The simplicity of the conceptualisation is impressive, and it is indeed surprising that much scholarship has not been expended on these terms given their uniqueness and special adaptability to outer space. However, the clinical study of the jurisprudential basis of jurisdictional powers has perhaps not been a strong point of space law literature. Just as no other international legal scholar of Bin Cheng's time had bothered to make such distinctions with respect to one of the most important doctrines of international law—i.e., jurisdiction the scholars of today are not engaging appropriately with concepts like biopower in their analysis of national and international space law. This is more disappointing as the legal doctrine of jurisdiction is one of the very pillars of intellectual reasoning about what States can do or not do in relation to virtually everything in outer space. *Jurisdiction* denotes the normative element of jurisdiction and it represents the powers a State has to adopt valid and binding legal norms and to concretise them with binding effect through its appropriate organs, whether judicial or otherwise. The spheres of validity or operative force of these norms may be realised *ratione loci* (territorial), *ratione instrumenti* (quasi territorial) or *ratione personae* (personal).<sup>88</sup> *Jurisdiction* on the other hand, is the formal element of State jurisdiction and it encompasses the powers a State possesses to, at any place or time, physically perform the acts of making, concretising or enforcing laws. That is it can hold legislative assembly, set up courts or tribunals or even

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<sup>87</sup> Bin Cheng, *The Legal Regime of Airspace and Outer Space: The Boundary Problem Functionalism versus Spatialism: The Major Premises*, 5 ANNALS AIR & SPACE L. 323, 340 (1980).

<sup>88</sup> Bin Cheng, *The Extra-Territorial Application of International Law*, 18 CURRENT LEGAL PROBLEMS 132, 136 (1965).

arrest wanted persons. From this point of view, “the validity of *jurisdiction* presupposes *jurisdiction*, but it is possible to have *jurisdiction* without *jurisdiction*.”<sup>89</sup> Biopower specifically aligns itself with *jurisdiction*.

It is important to highlight that with respect to aircraft, spacecraft and space stations as well as all persons and things therein, including the activities of such persons, individuals or corporate bodies, State jurisdiction is exercisable quasi territorially. The primary source of such jurisdiction is based on the principles of international customary law, which has for long now recognised State jurisdiction over flag-craft and even pirate vessels *jure gentium*.<sup>90</sup> *Jurisdiction* here is on a par (i.e., in terms of hierarchy and precedence) with the other types of *jurisdiction* (i.e., territorial, and personal) identified above, and the geographical scope is of course limitless. In other words, States can make laws into infinity of both time and space over things and persons they have control over under national and international laws.

Therefore, *jurisdiction* can be exercised with respect to an aircraft, spacecraft a fixed or floating space station, or even a foreign space port or such facility whether on earth, airborne or in outer space. *Jurisdiction* is also relevant in relation to all the forgoing, subject to the limitations introduced or foisted by practicality, the existence of competing foreign or other shared jurisdictions. It is thus clear that jurisdictions can be expected to clash. When such clashes do occur, international lawyers may have to untangle the priorities. In case of conflict between quasi-territorial *jurisdiction* and territorial *jurisdiction*, the latter overrides but the former as well over-rides personal *jurisdiction*.<sup>91</sup> This, of course is because though personal *jurisdiction* may be exercised from outside territorial sphere or quasi-territorially, such jurisdiction is clearly limited to its legislative and judicial forms. As Cheng aptly puts it:

[a] State may, in its own territory (or in *territorium nullius*) pass laws applicable to its nationals who are in foreign countries or on-board foreign craft that are not in its territory

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<sup>89</sup> *Id.*

<sup>90</sup> *Id.* at 135

<sup>91</sup> *See, e.g., id.* at 138-139.



and even try them in absentia, but it may not send its officers to where they are in order to arrest them.<sup>92</sup>

These two aspects of jurisdiction is what Foucault in his interdisciplinarity wrapped up in his biopower analysis even though he apparently comes out more strongly in emphasising the enforcement aspect of jurisdiction. However there is no evidence that Foucault was aware of Bin Cheng’s analysis or vice versa. It remains to now consider how Foucault’s biopower also relates to the jurisdiction to prescribe laws in all areas as it affects nationals.

### *C. Biopower as an Economic Tool*

Biopower travels on the “carrier waves” of economic and commercial realities and ambitions of the State. In other words “human beings are made subjects” for an economic purpose. Foucault argues that what we need is a new economy of power relations—the word economy being deployed in its theoretical and practical sense.<sup>93</sup> This coupled with the assertion that “the mechanisms of subjection” ought to be studied with reference to “mechanisms of exploitation and domination.”<sup>94</sup> This approach is particularly useful in understanding the role of power in organising the exploitation of space. The resources States routinely pour into outer space programmes either directly or recently through the private sector are therefore, explained under the Foucauldian presumption and submission of objectivising of the productive subject. Power is thus, obsessed with “. . . the subject who labours . . . the objectivising of the sheer fact of being alive...”<sup>95</sup> Even where

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<sup>92</sup> *Id.* at 137.

<sup>93</sup> Foucault, *supra* note 74, at 779.

<sup>94</sup> *Id.* at 782.

<sup>95</sup> *Id.* at 777; For instance, in February of 1981, the UK Government sold 51.57% of the shares in British Aerospace in order to return the company to private ownership. The remaining shares were finally sold in April 1985, but the Government retained a single £1 ‘golden share’ that would allow it to veto any possibility of foreign ownership. See *British Aerospace UK*, BAE SYSTEMS, <https://www.baesystems.com/en-uk/heritage/british-aerospace-uk#:~:text=In%20February%201981%2C%20the%20Government,any%20possibility%20of%20foreign%20ownership> (last visited Dec. 21, 2023).

the State disaggregates and shares power, it often retains power and does so for economic ends.<sup>96</sup>

Biopower is so pervasive in its manifestation that it may inevitably determine what truth is. This is particularly relevant to the divide and the debate over the legality of space mining as controversially conceptualised by rich, spacefaring States.<sup>97</sup> It can be argued, then that, the concept of truth is also linked to biopower because biopower determines what is true and what is not, what can and what cannot be done. Hence the question of whether outer space resources can be mined from a national regulatory point of view has already been judged by Foucault without directly addressing the point. He admitted of this possibility when he expressed the idea that knowledge itself is linked to power in that knowledge gives authority to truth and has the power to make itself the truth.<sup>98</sup> In other words what the State, in its regulatory power, determines as scientific or legal truth becomes truth. This is a form of “omnipotence” which English lawyers have summed up in the State’s competence to do everything that is not naturally impossible.<sup>99</sup> This is a concept also summed up in de Lolme’s famous maxim: “Parliament [in England] can do everything but make a woman a man, and a man a woman.”<sup>100</sup> The US House Committee on Science, Space, and Technology in introducing its controversial legislation allowing and approving space mining in space for its nationals arguably launched an assault on the common heritage of humankind principle in international space law but denies there is anything in the US Commercial Space Launch Competitiveness Act (2015)<sup>101</sup> (USCSLCA) which violates the US’s international obligations. According to the US House Committee on Science, Space and Technology, the very right to extract and use resources from

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<sup>96</sup> See *British Aerospace UK*, BAE SYSTEMS, <https://www.baesystems.com/en-uk/heritage/british-aerospace-uk#:~:text=In%20February%201981%2C%20the%20Government,any%20possibility%20of%20foreign%20ownership> (last visited Dec. 21, 2023).

<sup>97</sup> See Fabio Tronchetti, *Legal Aspects of Space Resource Utilization*, in HANDBOOK OF SPACE LAW 769, 788-89 (Frans von der Dunk & Fabio Tronchetti eds., 2015).

<sup>98</sup> Mona Lilja and Stellan Vinthagen, *Sovereign Power, Disciplinary Power and Biopower*, 7 J. POL. POWER 107, 110 (2014).

<sup>99</sup> WILFRID PREST, WILLIAM BLACKSTONE: LAW AND LETTERS IN THE EIGHTEENTH CENTURY, 160-161 (2008).

<sup>100</sup> See A. V. DICEY, INTRODUCTION TO THE STUDY OF THE LAW OF THE CONSTITUTION, 5 (10th ed. 1982) (quoting de Lolme).

<sup>101</sup> See Pub. L. No. 114-90, § 403 (2015).

celestial bodies “is affirmed by State practice and by the US State Department in Congressional testimony and written correspondence.”<sup>102</sup> As a result of this view USCSLCA provided in section 402 as follows, “[a] US citizen engaged in commercial recovery of an asteroid resource or a space resource shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell it according to applicable law, including US international obligations.”<sup>103</sup>

Even after such permissive and unprecedented permission of exploitative rights over what is essentially the common heritage of humankind Sec. 403 of the USCSLCA provides that: “It is the sense of Congress that the United States does not, by enactment of this Act, assert sovereignty or sovereign or exclusive rights or jurisdiction over, or ownership of, any celestial body.”<sup>104</sup> By all objective standards these are significant contradictions and it needs only be noted that biopower apparently thus, permits denial of international reality.

It is true that there is no unanimity that space is the “common heritage of [hu]mankind.” There has always been and there still remains the view that the CHM principle is merely a term of art that, for outer space law, is only found in the Moon Agreement.<sup>105</sup> The fact that the Moon Agreement has a small number of signatories is pointed at as a signifier of its impotence in birthing an important universal principle as friends of the CHM principle assert.<sup>106</sup> Critics of the CHM principle also point to the fact that none of the signatories to this treaty are major space powers. Indeed, the assumption appears to be that the reason for the low number of signatories is

<sup>102</sup> *The Facts Behind SPACE Act*, SpaceRef Editor, (May 21, 2015) <https://space-ref.com/press-release/the-facts-behind-space-act/>.

<sup>103</sup> Pub. L. No. 114-90, § 402 (codified at 51 USC. § 51303).

<sup>104</sup> *Id.* § 403.

<sup>105</sup> Note particularly Moon Agreement, *supra* note 12, at art. 11. See Naman Khatwani, *Common Heritage of Mankind for Outer Space*, *ASTROPOLITICS THE INTERNATIONAL JOURNAL OF SPACE POLITICS AND POLICY* 17(2):1-2 (July 2019). Wang and Huang speak somewhat in a derogating manner about the import of the CHM when they wrote: “. . . the 1979 Moon Agreement, which established the CHM principle in space, with its meaning perhaps being one of the vaguest (for legal certainty) among the five major UN treaties in space.” Guoyu Wang & Xinyi Huang, *On the Common Heritage of Mankind Principle in Space*, 211 *ACTA ASTRONAUTICA*, 927, (2023).

<sup>106</sup> See e.g., Hope M. Babcock, *The Public Trust Doctrine, Outer Space, and the Global Commons*, 69 *SYRACUSE L. REV.* 191, 215-16 (2019).

directly connected to the rejection of the CHM principle by the United States.<sup>107</sup> Thus, the CHM is not accepted by those opposed to it as characterizing the legal status of outer space and celestial bodies. At best critics assert that the principle is binding only on State parties to the Moon Agreement.<sup>108</sup> In essence, the prevalence of the CHM principle is seen as a mistaken idea.

If this position is correct, then there will be nothing wrong with the exercise of the USA and Luxembourg biopower in space and their particular return to the Westphalian manifestation of State sovereignty which permits such self-centered approach to space activities.

At the heart of the idea of this sort of biopower of States appears to be a prevailing philosophy of private enterprise in outer space.<sup>109</sup> Foucault was a quintessential critical scholar. Yet his appreciation of biopower was essentially positivist and matter of fact rather than ideological. This increases the usefulness of the concept of biopower in explaining the rising phenomenon of permissive regulatory regimes for outer space particularly in terms of commercial use, resource exploration, and asteroid mining. Foucault was near the end of this life when he wrote in considerable detail about biopower in his lecture series in 1978.<sup>110</sup> He was clinical, forensic, and rather less concerned with ideology in analyzing the role of power in the organization of society. These precise age and intellectual conditions make his ideas very useful today in understanding the trend towards free market enterprise and capitalism in the space law of the 21st century.

In so many ways the work of Foucault and his cynicism about power is useful for space lawyers as tools and reference points in understanding the imperatives of regulation in the shared common heritage of humankind that is outer space. The subjects, power and knowledge form a tridimensionality in Foucault's philosophy. It remains to extend this tridimensionality to the tridimensionality of

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<sup>107</sup> Thomas Cheney, *Sovereignty, Jurisdiction, and Property in Outer Space: Space Resources, the Outer Space Treaty, and National Legislation*, at 17 (Thesis, Northumbria University, Jan. 2020), <https://researchportal.northumbria.ac.uk/en/studentTheses/sovereignty-jurisdiction-and-property-in-outer-space-space-resour-3>.

<sup>108</sup> *Id.* at 129-130.

<sup>109</sup> Rochus Moenter, *The International Space Station: Legal Framework and Current Status*, 64 J. AIR L. & COM. 1033, 1052 (1999).

<sup>110</sup> FOUCAULT, *supra* note 75.

State jurisdiction in international law to show how human beings may have been made subject and being objectified literally into infinity of time and space.

In his essay *Why Study Power?* Foucault reveals how the human mind is configured to accept leadership and power of the State.<sup>111</sup> The human becomes an object not only as a thing to be studied in him or herself but as an incidence of subjectified regulation.<sup>112</sup> The insistence on specific rationalities reflects power which allows regulation to take specific directions. In his study of biopower he States that our understanding of power comes from the right of the government and the ruler.<sup>113</sup> Indeed the power of law over us is all governed by the pain of the State. The power of the ruler is also practical and necessary. The protection of the State is needed for instance upon re-entry on to Earth with any of the bounties of space exploration. This is perhaps why no permanent communities of Stateless humans or corporations exist as of yet in space. Foucault thus, helps us to configure biopower as the basic rudiment of expression of power, jurisdiction, and control. The methods of these powers, these juridical powers are all under the right of the State to produce biopower. It seeks to understand peoples need as well to accept it and to allow the State to direct peoples action and even aims in space.

In this way biopower can constrain possible futures and can be used to break down barriers to the will of the State. An example of the former is when citizens, officials and even private actors are faced with prohibitions and other constraints by their State of nationality they will comply in their actions to be in tune with the States interest. Thus, the insistence of Elon Musk's company, Space X, that anyone going with the company to occupy Mars must be citizens of the USA (or those with a special approval from the Secretary of State).<sup>114</sup> In this way we are reminded that even the

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<sup>111</sup> See Foucault, *supra* note 74, at 794.

<sup>112</sup> See *id.* at 787.

<sup>113</sup> See *id.* at 788.

<sup>114</sup> In response to a question at the International Astronautical Congress in Guadalajara, Mexico in 2016 Elon Musk, the CEO of Space X revealed his powerlessness in the face of statist biopower. The question was: "you're going interplanetary but you're not going international when are you going to hire people from countries than the US?"; Elon Musk explained the requirements of US regulations on anyone working on advanced rocket technology. He explained that his company's understanding is that there is a

apparent project of humankind to tame outer space is still tethered to the sociological and maybe even ethnic “bio loyalties” on Earth.<sup>115</sup> Judicial power remains repressive and reduces or removes the individual’s power to act in certain ways even in an environment where the very physical presence of the State does not exist.<sup>116</sup> In outer space the State’s police personnel may not be there, but the powers of the State would typically have limited or controlled the right of non-subjects persons and corporates to venture there in the first place. State power may preclude nonnationals (which include juridical bodies such as private corporations) from being involved at the recruitment/planning stages of space experimentation and space missions. Arguably, therefore, the restrictive force of biopower becomes amplified rather than receding in outer space. Examples of this near divine and “jealous”<sup>117</sup> regulatory philosophy in outer space regulation abound in the UK’s principal space regulation Space Industry Act (2018) and as discussed below.

An example of the battering hammer utility and effect of biopower in space can be seen in the return to a Westphalian biopower expressed in the ongoing assault on the hitherto wide scope of conception of the non-appropriation principle in space law. The charge is of course, led by the US which has in addition to its the Space Resource Exploration and Utilization Act of 2015 been able to get other States to sign up in the Artemis Accords to the nonbinding idea that “the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty.”<sup>118</sup> The section also provides that contracts and other

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requirement that persons potentially going to Mars under proposed plans must be US citizens. To conform to US Government space technology export regulations, an applicant must be US citizens or lawful permanent resident of the country. They may also be a protected individual as defined by 8 USC. 1324b(a)(3), or eligible to obtain the required authorizations from the US Department of State. Clearly therefore, a close connection and preferably biopower of the US must be exercisable over such persons. Thus, as a matter of corporate policy and practice SpaceX only hires Americans with American Green cards. See *Elon Musk Explains Why SpaceX Only Hires Americans*, INVERSE (Sept. 28, 2016), <https://www.youtube.com/watch?v=CIVtiNpKEY0>.

<sup>115</sup> *Id.*

<sup>116</sup> See Turkel, *supra* note 2, at 173.

<sup>117</sup> “You shall not bow down to them or serve them, for I the Lord your God am a jealous God, visiting the iniquity of the fathers on the children to the third and the fourth generation of those who hate me, but showing steadfast love to thousands of those who love me and keep my commandments.” *Exodus* 20:4-6.

<sup>118</sup> Artemis Accords, *supra* note 40, § 10.

legal instruments relating to space resources should be consistent with that Treaty.<sup>119</sup> The signatories however emphasize that the extraction and utilization of space resources, including any recovery from the surface or subsurface of the Moon, Mars, comets, or asteroids, should be executed in a manner that complies with the Outer Space Treaty and in support of safe and sustainable space activities. These provisions, along with the protection of “heritage sites”<sup>120</sup> and the admonition to ensure that space resources can benefit humankind by providing critical support for safe and sustainable operations,<sup>121</sup> help to soften the blow against the arguably more popular concepts of province of humankind in the Outer Space Treaty<sup>122</sup> and the common heritage of humankind in the Moon Agreement.<sup>123</sup>

#### IV. RECONCILING BIOPOWER AND THE *LEX MERCATORIA* IN THE 21ST CENTURY CONTEXT OF SPACE LAW

The term *lex mercatoria* belongs to that long list of legal terms upon which lawyers do not agree on a satisfactory definition. It is said to have arisen from the regular meetings between merchants, essential in founding a body of common custom, took place throughout Europe at the great fairs of Champagne, Lyons, Anvers, Genoa.<sup>124</sup> The *lex mercatoria* today is seen as soft law developed to govern the rights and responsibilities of merchants in transnational trade. Whereas “transnational law” properly so called is the harmonized commercial law at the international level, which is the product of various means, spanning international conventions, contractually incorporated uniform rules, international restatements, model laws and conscious or unconscious legislative or judicial

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<sup>119</sup> *Id.*

<sup>120</sup> *Id.* § 9.

<sup>121</sup> *Id.* § 10(2).

<sup>122</sup> Outer Space Treaty, *supra* note 8, art. I.

<sup>123</sup> Moon Agreement, *supra* note 12, art. 11.

<sup>124</sup> Charles Donahue, Jr., *Medieval and Early Modern Lex Mercatoria: An Attempt at the Probatio Diabolica*, 5 CHICAGO J. OF INT'L L. 21, 28 (2004); Maura Fortunati, *The Fairs Between Lex Mercatoria and Ius Mercatorum*, in LEX MERCATORIA TO COMMERCIAL LAW 145 (Vito Piergiovanni ed. 2005); Ralf Michaels, *The True Lex Mercatoria: Law Beyond the State*, 14 IND. J. OF GLOB. LEGAL STUD. 448 (2007).

parallelism.<sup>125</sup> This concept will likely apply to space mining and other commercial relationships involving outer space.

We have pointed out the connection between the coercive policing powers of the State and the organization of places of interest to the State in commercial and economic terms. Policing powers of the State are central to the significance of State sovereignty and the crude(ish) elements of State power. Foucault correctly believes that the act and forms of policing shape the design of human settlements, mercantile aims, and traditions. These aspects in turn determine the aims of policing. Casting this description into outer space we can begin to see that the State's aims and objectives will be reflected in the type of State coercive presence in space.

In essence in this century just as in previous ones, the aporic commercial interests of the State will again determine not only the extent of policing powers that will be needed but the nature of what can be exploited. This leads us to believe that collective exercise of biopower by leading commercial space powers would in time come to assimilate the interests of the merchant classes. The interaction between the interests of the State and those of the business classes at home and abroad will in time combine to determine when and where things can be exploited and sold in outer space regardless of the existing common morality of humankind which is still against national ownership of outer space resources.

In this sense asteroid mining presents the latest phase in the tensions between the *lex mercatoria* and national power. The *lex mercatoria* said to have started during the medieval period in the regular international markets of Europe is arguably both a friend and foe of Foucault's description of biopower concept of biopower as described by Foucault. The *lex mercatoria* is beyond one State and it is a body of law shared by the merchant classes of the commercial nations. It arises out of a diffusion of State power by virtue of the unsolicited influences and contributions of the relevant merchant

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<sup>125</sup> See PHILIP JESSUP, TRANSNATIONAL LAW 2 (1956).



communities. It is therefore, enigmatic,<sup>126</sup> flexible,<sup>127</sup> and multiethnic.<sup>128</sup>

The legal regime of the medieval marketplace and the emergent picture of international space stations/space commercial mining zones are comparable in certain important respects. They share the need for the retention of the raw biopower, security and policing presence from at least one State.<sup>129</sup> They, however, appear to retain the alluring freedom of broadly determined international economic/mercantile traditions. These traditions and customs of trade determine important interests and practices such as in dispute management. The immediate difference between the biopower exercisable in the medieval market town and a space station is that the former took place in the context of at least one country's physical jurisdiction while the latter takes place in the *res omnium extra commercium* environment of outer space.<sup>130</sup> While the sources of the biopower in both instances are the same (i.e. emanating from the sovereignty of the State) the manifestation of biopower in outer space is potentially shared (in the case of international space stations). Furthermore, international laws may prevent a State's biopower from operating in certain ways such as permitting Nuclear Weapon Tests in the Atmosphere or in Outer Space.<sup>131</sup> Another example of the controversial exercise of biopower will be the new national regulations that permit nationals, particularly private corporations to engage in space mining.<sup>132</sup> Biopower however, continues to literally determine the shape of human settlements as it has always done. Indeed, biopower now may be configured and applied with respect to the higher planetary grounds away from the earth.

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<sup>126</sup> Michael Frischkorn, *Definition of the Lex Mercatoria and the Effects of Codifications on Lex Mercatoria's Flexibility*, 7 EUR. J. L. REFORM 331, 349(2005).

<sup>127</sup> *Id.* at 331

<sup>128</sup> Gbenga Oduntan, *The Reimaginarium of Lex Mercatoria: Critique of the Geocentric Theory About the Origins and Episteme of the Lex Mercatoria*, 13 MANCHESTER J. INT'L ECON. L. 63, 78 (2016).

<sup>129</sup> See Outer Space Treaty, *supra* note 8, at art. VI.

<sup>130</sup> Gbenga Oduntan, *Imagine There are No Possessions: Legal and Moral Basis of the Common Heritage Principle in Space Law*, 2 J. INT'L ECON. L. 30, 53 (2005).

<sup>131</sup> As early as the 1960s agreements were adopted to prevent weaponization of outer space territories and orbits. Examples include the Partial Test Ban Treaty, formally titled the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, Oct. 10, 1963, 480 U.N.T.S. 43 (1963) and the Outer Space Treaty, *supra* note 8.

<sup>132</sup> See, e.g., 51 USC. § 51303.

In doing this biopower arguably employs the ingredients of sovereignty and jurisdiction found under international law

Thus, for good or for bad the duty to draw up the blueprint of commercial operations is still tied to the apron string of the regulatory State. As Foucault explains biopower determines the architecture of:

...the town and the road, the market, and the road network feeding the market...the urbanization of the territory. Basically, this involved making the kingdom, the entire territory, into a sort of big town; arranging things so that the territory is organized like a town, on the model of a town, and as perfectly as a town.<sup>133</sup>

Power in this sense is both political and imaginative. The imagination of what can be done on earth and in space springs from the imagination of the State. Biopower is simply the conduit by which direct action and influence is exercised.

Just as jurisdiction has always followed the flag, the establishment of coercive powers in space is, therefore, inseparable from governmental theory and practice. However, the trend even in this area seems to be moving towards mercantilism, deregulation, and privatization. This in a sense will not change in the story of space stations and space mining in this century. The State may often explain the need for its policing powers through the explanation of its need to maintain pastoral care. As in the previous centuries it is predictable that the “officials of pastoral power” will increase in space.<sup>134</sup> They may be there in disguised or hybrid forms, but they are always instruments of the biopower exercisable by the State. As Foucault reminds us, “we must not forget that in the eighteenth century the police force was not invented only for maintaining law and order, nor for assisting governments in their struggle against their enemies, but for assuring urban supplies, hygiene, health and standards considered necessary for handicrafts and commerce.”<sup>135</sup>

Crucially, Foucault identifies the significance of the fact that “power was exercised by private ventures, welfare societies,

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<sup>133</sup> FOUCAULT, *supra* note 75, at 336.

<sup>134</sup> Foucault, *supra* note 74, at 784.

<sup>135</sup> *Id.*

benefactors, and generally by philanthropists”<sup>136</sup> Even the family was mobilized at this time to take up pastoral and policing functions.

Foucault’s construct of power can, therefore, be used to draw a picture which is both similar and dissimilar to the story of the *lex mercatoria*. Contemporary competition between European and western States and their interactions with other international players in the space industries is likely to create a new *lex mercatoria* in outer space. Thus, Foucault’s analysis is a good springboard to understand governmental and sovereign power in space. Power in this sense is the base of the “influencious influence” exercised upon the human beings engaged in space activities or on corporate bodies that are legitimated via Westphalian States. It is the political base of the concept of legal jurisdiction which legal scholars like Bin Cheng further problematize in their own lawyerly fashion.<sup>137</sup> Power is not only the means by which order, and disorder are maintained in outer space through national and international outer space law; but commercial power is also the end for which biopower exists.

Commercial power as an aspect of biopower has always been identified by older legal jurists like Bentham under the principle of coercive security and policing functions of the State.<sup>138</sup> These are effective and aggressive powers of the State that works to permit and to dissuade. Bentham implies that the law must be especially concerned with the attainment of commercial objects and ultimately shapes the direction of investment of commercial enterprise. He wrote that:

The Law does not say to a man, “Work and I will reward you;” but it says to him, “Work, and by stopping the hand that would take them from you, I will ensure to you the fruits of your labour, its natural and sufficient reward, which, without me, you could not preserve.” If industry creates, it is the law which preserves: if, at the first moment, we owe everything to labour, at

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<sup>136</sup> *Id.*

<sup>137</sup> See Cheng, *supra* note 88, at 135-39. As mentioned above Bin Cheng introduced a powerful exposition of jurisprudential powers in the 1950s in the form of two concepts *jurisfaction* (ability to make rules governing the person) and *jurisaction* (ability to enforce and concretize the rules made).

<sup>138</sup> See, e.g., H.L.A. Hart, *Bentham on Legal Powers*, 81 YALE L. J. 799, 805 (1972).

the second, and every succeeding moment, we owe everything to the law.<sup>139</sup>

In this way, we can foresee how biopower may lock States like the USA and Luxembourg to commit to the aggressive protection of exploitative rights in space in the course of time. Hence there is a danger in the direction of conflicts over the interpretations of the *lex mercatoria* in space.

What is left to explain is that no State should be able to rely on the exercise or refusal to exercise of its own biopower to justify abuse of its commitments under international law in space. This much can be distilled from the conclusions of some contemporary writers like Maria Lucas-Rhimbassen who are correctly drawing attention to potential clashes between national space laws and policy (the bases for biopower) and higher ethical principles in international space law.<sup>140</sup> These writers persuasively warn that international law treats outer space as “sanctuary,” but now national imagination is gradually considering space as an ecosystem filled with business opportunities the onus is on nations to evolve sustainable, business models and to find and embrace creative and innovative ways in which they would comply with pre-existing space ethics.<sup>141</sup> What this means for countries is that they must exercise their biopower selectively through national codes and actions to maximize pleasure and minimize pain towards utilitarian ends. If as Jeremy Bentham claimed “human nature may be pronounced to be everywhere the same.”<sup>142</sup> The sociological pressure of biopower must be exercised in a more disciplined manner by States in policing the actions of all their nationals in space. If this is done by all States then the *lex mercatoria* for space will not conflict with space ethics. If and when the odd deviant appears in space operations punishment reserved by States should work to modify behavior because the same principles of human and consequently indeed corporate

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<sup>139</sup> Jeremy Bentham, *Principles of the Civil Code*, in 1 THE WORKS OF JEREMY BENTHAM 302 (1843), <https://oll.libertyfund.org/title/bowring-the-works-of-jeremy-bentham-vol-1>.

<sup>140</sup> See, e.g., Lucas-Rhimbassen, *supra* note 45, at 1.

<sup>141</sup> *Id.* at 1-2.

<sup>142</sup> Dean Alfange Jr., *Jeremy Bentham and the Codification of Law*, 55 CORNELL L. REV. 58, 73 (1970).

behavior will apply “everywhere, somewhere and no matter where.”<sup>143</sup>

#### V. PATTERNS OF REGULATORY BIOPOWER IN SPACE

State biopower is expressed in an increasing number of national laws directed towards space. We shall highlight a few examples of these below. The arrangements for the interactions between biopowers are contained under international space law widely construed, especially in those treaties that define what is permitted and prohibited in outer space.<sup>144</sup>

The Westphalian sovereignty system that operates in modern international law in many ways dictates a duty upon States to maintain jurisdiction over all legitimate confines of national territory and other non-sovereign spaces of which they have legitimate control. In this sense, the exercise of biopower is an involuntary and necessary attribute of Statehood. This power extends to all persons and corporate interests under the State’s jurisdiction and control by virtue of the requirements of registration, nationality, and ownership. In simple terms there is the demand that nationality-based jurisdiction should be exercised over nationals, regardless of their territorial location. This is best encapsulated under the “active personality” doctrine in international law.<sup>145</sup> International law abhors Statelessness because of its stark deleterious effects on persons and on States.<sup>146</sup> One thing however, is clear just as a Stateless person was treated as a “*res nullius*,” or a “*caput lupinum*” whose presence threatened the stability of the post-war international order in

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<sup>143</sup> *Id.* at 78.

<sup>144</sup> See Linda Billings, *To the Moon, Mars, and beyond: culture, law, and ethics in spacefaring societies*, 26 Bull. Sci., Tech., & Soc’y 430, 431 (2006).

<sup>145</sup> See CEDRIC RYNGAERT, *JURISDICTION IN INTERNATIONAL LAW* 104-110 (2d ed. 2015).

<sup>146</sup> See N. Jain, *Manufacturing Statelessness*, 116 Am. J. Int’l. L. 237, 237-239 (2022). Jain in his brilliant article on Manufacturing Statelessness regales us with the tale of a certain Gerard Gales, an American seaman and the fictional protagonist of B. Traven’s sensational novel *The Death Ship*. From being unluckily stranded in Antwerp, paperless and without means and facing brutal bureaucracy from States, prisons, consulates, and police stations he ended up on the—the “death ship” *Yorikke*. This vessel was the only entity that will accept a person like him, no questions asked. Part of that deal of course is a descent into arms smuggling along with other stateless, homeless, or undocumented individuals like Gales. Yet there are a reported 3.9 million people that are currently stateless.

1945,<sup>147</sup> so too will the idea of Stateless persons or corporations be regarded with odium in international relations of the 21st century. Just as the Stateless person throughout the last century “inhabits an existential precariousness that knows no escape,”<sup>148</sup> great care must be taken by all States today to prevent a lack of jurisdictional cover or what may be called a total failure of all manifestations of Foucault’s biopower in relation to any individual or corporate body. None of the well-known theories of international relations appears to sit comfortably with the idea of anarchic outer space. That is arguably a good thing since the opportunities outer space affords humankind is too important to waste through a return to primordial arrangements or sentiments. Liberalism perhaps provides some comfort for those who believe that human beings are innately good and will generally be of good behavior in outer space activities.<sup>149</sup> In truth liberalism, widely regarded as the dominant theory of international relations, arguably unduly indulges in an intolerable high level of political naiveté which is not backed by the realism of early results coming in on the behavior of corporations particularly in outer space. Yet the connections between liberalism as a political and economic theory and liberalism as international relations in outer space theory are becoming increasingly apparent.

The imperatives of curtailing runaway liberalism in space law and policy ought to be clear. There are selfish reasons why States may want to have properly developed laws extending jurisdiction over space activities. However, there are significant shared responsibilities that dictate the duty to exercise biopower as well. States are responsible for the activities of their private sector entities in outer space in consonance with Article VI of Outer Space Treaty.<sup>150</sup> It is thus good policy for national parliaments in accordance with treaty obligations to carefully provide for laws that regulate (a) liability for damage to space objects,<sup>151</sup> (b) registration and nationality of space objects and spacecrafts,<sup>152</sup> (c) retention of jurisdiction and

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<sup>147</sup> *Id.* at 241.

<sup>148</sup> *Id.* at 286.

<sup>149</sup> JOHN BAYLIS ET AL., *THE GLOBALISATION OF WORLD POLITICS* 117 (7th ed. 2017).

<sup>150</sup> Outer Space Treaty, *supra* note 8, at art. VI.

<sup>151</sup> See Liability Convention, *supra* note 10, at art. III.

<sup>152</sup> See Registration Convention, *supra* note 11, at art. II.

control.<sup>153</sup> These are basic minimums for the maintenance of international commercial order in outer space.

Even the newer States that are involved in space activities such as South Africa and Nigeria provide ample provisions geared towards exercise of biopower in space.<sup>154</sup> It is an interesting fact that both these States have dedicated national laws and space agencies that are older than Luxembourg's. Both are discussed here because they arguably have the most advanced space legislation on the African continent.

Notably South Africa has made elaborate provisions in its laws for the exercise of both jurisdiction *ratione personae* and jurisdiction *ratione materiae* in outer space.<sup>155</sup> The former applies in relation to jurisdiction refers to the personal jurisdiction over natural and corporate persons bearing the nationality of a State.<sup>156</sup> In this way South Africa's biopower becomes legally amplified through regulation. The latter applies in relation to jurisdiction over space objects, vessels and objects like ships, aircraft, spacecraft that bear the flag of a State and are therefore, subject to the jurisdiction of the flag State.<sup>157</sup>

Nigeria's comprehensive national space legislation/regulation is the National Space Research and Development Agency (NASDRA) Act 2010 which among other things created its own space agency.<sup>158</sup> The scope of the NASRDA Act covers regulation of space objects' launch and return.<sup>159</sup> Nigerian legislation provides

<sup>153</sup> See Outer Space Treaty, *supra* note 8, at art. VIII.

<sup>154</sup> South Africa has perhaps the most comprehensive national space legislation/regulatory environment in Africa. Applicable legislation in force include: Statutes of the Republic of South Africa—Trade and Industry, Space Affairs Act, No. 84 (1993) (S. Afr.); Space Affairs Amendment Act, No. 64 (1995) (S.Afr.); South African National Space Act No. 36 of 2008; Act No. 21 of 2007 (S. Afr.); Astronomy Geographic Advantage Act, 2007 (S. Afr.); Spatial Data Infrastructure Act No. 54 of 2003 (S. Afr.); Electronic Communications Act No.36 of 2005 (S. Afr.). The South African National Space Agency (SANSA) came into being in December 2010 and is guided by the National Space Policy of 2008 and National Space Policy of 2009. SANSA operations fall into four programme areas: Earth Observation, Space Engineering, Space Operations, and Space Science. South Africa is also member of UNCOPUOS, APRSFAF and ITU and UNIDROIT.

<sup>155</sup> See Space Affairs Act, No. 84, at art. 11, 12 (1993) (S. Afr.).

<sup>156</sup> See Cheng, *supra* note 88, at 135.

<sup>157</sup> See Space Affairs Act, No. 84, at art. 14.

<sup>158</sup> National Space Research and Development Agency (NASRDA) Act, ¶ 1, No.9 A 1249 (2010) (Nigeria).

<sup>159</sup> *Id.* ¶ 6.

for jurisdiction over materials placed in space and space objects but curiously left out specific references in its provisions for *rationae personae* jurisdiction. Jurisdiction *rationae personae* however, is the very base of biopower. Jurisdiction *ratione materiae* is meaningful only where it coincides with jurisdiction *ratione personae* and the biopower of the State at an earlier point. In this way the country's space regime arguably falls short of the level of meticulous legal drafting on the issue befitting a country with an ambitious space programme which includes running its own indigenous astronauts' programme. It is, however, also true that biopower flows by virtue of Statehood and operation of international law as well. Discipline and the dispensation of pain and rewards which are attributes of biopower are provided under the specific rules for authorisation and licensing in both the pertinent South African and Nigerian Acts. Both regimes indicate mandatory rules prescribing continuous exercise of supervision by the countries. Both countries' laws control non-governmental entities and the duty of operators to maintain liability and insurance. We have indeed argued elsewhere that in relation to African developing nations the policies and laws of Algeria, Nigeria and South Africa are presently the clearest and most ambitious in indicating national strategic interests of developing States in space.<sup>160</sup> As a result it is arguable that these States also have the best expressions of Foucauldian biopower in outer space among African States. It is also clear from the types of laws these States have passed that they have the commercialisation of outer space in firm view in their making of space law and policy.

## VI. BIOWPOWER AND THE DANGERS OF THE REGULATORY STATE IN OUTER SPACE

On the whole there is a recognizable push towards recognition of the need of States to beam up their biopower into space. This development is more visible in the regulatory State. Regulatory States are typified by a much more loosely coordinated set of public agencies marked by their own district cultures and modes of operation, and by an emphasis on interdependence, disaggregation, a

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<sup>160</sup> Gbenga Oduntan, *Geospatial Sciences and Space Law: Legal Aspects of Earth Observation, Remote Sensing and Geoscientific Ground Investigations in Africa*, 9 GEOSCIENCES 149, 156 (2019).



segmented executive, policy networks, governance and hollowing out of the State.<sup>161</sup> Regulatory States include the US, UK, Canada and Australia.<sup>162</sup> In these States many of which are technological powerhouses with active space programs the command and control bureaucracy typified by closely controlled government space programs has been modified in favor of much more loosely controlled and coordinated public, semi-public and outright private space programs. Furthermore, in these States outer space is one of the vast new areas of economic life that has been in a sense colonized by law and now administered by specialized regulatory agencies.<sup>163</sup> State biopower however, also stands in the path of danger of assault by elitist groups especially corporations because of its strong Westphalian sovereignty traditions.

The gradual movement of regulation into private hands in financial regulation, trade and competition, labor standards, the environment, nuclear energy telecommunications, sea and air transportation as well as the phenomenon of deregulated market actors in global cities also now affect outer space affairs.<sup>164</sup> For example in respect of air transportation it has been noted that “it is not excessively rhetorical to say that the sovereignty of Boeing exceeds and considerably supplants that of nation-States in this regime. Certainly, no nation-State apart from the US can compete with Boeing as a shaper of the global airworthiness regime.”<sup>165</sup> Corporate interests are already perfecting their game plan on the corporate takeover of outer space resources with actions ranging from so called real estate deals on a planetary basis to space mining plans. The strategy of these corporate and technocratic groups includes the weaponization of the biopower of strategic States to influence the direction of national and international laws towards the ends of profit from space resources. International law is of course shaped by State practice hence the capturing of biopower of States will inevitably determine the agenda of States’ actions on a global scale. This

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<sup>161</sup> Michael Moran, *The Rise of the Regulatory State in Britain*, 54 *Parliamentary Aff.*, 19, 20 (2001).

<sup>162</sup> Karen Yeung, *The Regulatory State*, in *THE OXFORD HANDBOOK OF REGULATION* 64, 65 (Robert Baldwin et al. eds., 2010).

<sup>163</sup> Moran, *supra* note 161, at 20.

<sup>164</sup> See JOHN BRAITWAITE & PETER DRAHOS, *GLOBAL BUSINESS REGULATION* 124, 206-214, 279-284, 349-350, 431, 463-466 (2000).

<sup>165</sup> *Id.* at 463.

development will in time spell havoc for sustainable use of outer space. The primacy of deregulated market actors in outer space ought to be resisted. Deregulation and privatization of space activities may soon allow private actors to do whatever they would like to do in outer space. The recognizable cycle whereby governmental commissions are set up only to consist of experts that are notoriously friendly towards runaway market principles must be averted in space law. Experience shows that even where academics and intellectuals are invited onto such commissions, they are often left in the dark. What essentially develops is an alliance between the executives and the private companies.<sup>166</sup> This inevitably sways power dangerously into the hands of corporations. Power ought to be neutral, but experience has shown that when wielded by private parties and for private ends in the common spaces of humankind this threatens the general good of the citizenry and the international system.

A clear danger of this mode of regulation is that of regulatory capture. Space companies and their owners command considerable resources in monetary terms and skilled manpower, there is a danger that these powerful actors will use their influence widely defined to capture the regulator with which it is in closely interaction. This danger is particularly in relation to States like the USA “where regulated industries often offer lucrative careers to those working in regulatory agencies.”<sup>167</sup> Although the capture of State biopower by corporations in individual States may be worrisome what is worse is the evolution of transnational networks of private space actors capable of emancipating themselves from State biopower or capturing the very essence of biopower by creating parallel set of norms.<sup>168</sup> New models of expert governance of space law based on new paths of solidarity and cooperation between largely western corporations will spell doom for carefully settled principles of communitarian international space law. This is the real threat posed by the model of the emergence of the Luxembourg space Act and its older cousin the US Commercial Space Launch Competitiveness

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<sup>166</sup> See Saskia Sassen, *The State and Globalization: Denationalized Participation*, 25 MICH. J. INT'L L. 1141, 1142 (2004).

<sup>167</sup> Moran *supra* note 161, at 31.

<sup>168</sup> See Helene Ruiz Fabri & Andrea Hamann, *Transnational Networks and Constitutionality*, 6 INT'L J. OF CONST. L., 481, 488 (2008).

Act (2015). The possibility if not inevitability of contagion is adequately described in persuasive literature by the authors who conclude that “more and more of the traditionally public sphere, including even some functions traditionally reserved to a monarch, is being taken over by private actors, with a tendency developing toward subcontracting these functions”<sup>169</sup> The immediate danger in this situation is the decrease in the requisite amount of utilitarian pain needed to induce conformity.<sup>170</sup> This will therefore increase discordance in space particularly between space powers and other States as well as divergence in space law away from the much fought for and earned ethics.

There is good basis for concluding that States that allow liberal scope for interference into the exercise of biopower in outer space by corporate networks are sailing close to the wind. Experience of course, has shown that the consequences of corporate governance interference with biopower often leads to neglect, discrimination, erosion of protective measures and eventually catastrophic events. Examples of these are the massive corporate governance failure scandals, such as the Grenfell Tower fire in the UK,<sup>171</sup> and the Coronavirus pandemic that exposed many developed States as failed regulatory States.<sup>172</sup>

## VII. CONCLUSION

Power in space whether in terms of biopower, *jurisdiction*, *jurisdiction*, *jurisdiction*, jurisdiction, Westphalia sovereignty or regulatory State must be exercised for the common good of the nation State and its inhabitants as well as in the interests of humankind in general. Commercial uses of space by its corporate or natural nationals are within the regulatory competences of a sovereign State However, if law has any role to play in outer space at all it must be to promote

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<sup>169</sup> *Id.*

<sup>170</sup> See Hart, *supra* note 138, at 805; see also Alfange, *supra* note 142, at 64-73. The Benthamian pleasure and pain applies easily here as well. The pleasure is exclusively for the party favored; the pain for all who do not share the favor.

<sup>171</sup> Noor-ul Muzamil Khan & Paul Haynes, *The Role of Corporate Governance Failure in the Grenfell Tower Fire*, at 2 (Feb. 18, 2021), <https://ssrn.com/abstract=3783861>.

<sup>172</sup> See Lee Jones, *How the Coronavirus Pandemic has Exposed Britain's Failed Regulatory State*, MILE END INST. (Feb. 1, 2021), <https://www.qmul.ac.uk/mei/news-and-opinion/items/how-the-coronavirus-pandemic-has-exposed-britains-failed-regulatory-State—dr-lee-jones.html>.

sustainability in all human actions. The base feature in all phases of the exercise of biopower must therefore, be the promotion of sustainable use of all aspects of outer space. We believe that Power in space can be explained through the Foucauldian concept of biopower. Foucault correctly demonstrates that what justifies doing something one way or the other is power. In essence power is to be used positively or not. The future of biopower in space is bright or at least ought to be bright. Much rests on the continued ascendancy of regular exercise of national biopower in space. There are severe dangers in a loosening of biopowers gravitational pull in favor of a rule of joint exercise of biopower by itinerant non-State actors in space. Within our common lifetimes we have seen how too much of neoliberal deregulatory arrangements and inconclusive systems of diffused and diversified power sharing arrangements have literally led to tears for human communities.<sup>173</sup>

The positive use of power in outer space will be one that takes adequate account of the sustainable use of the common resource of humankind and its common heritage. Even if anyone successfully attacks the common heritage of humankind principle in the Moon Agreement as non-binding that attack cannot also successfully take down the province of humankind provision in the substantive provisions of the Outer Space Treaty. Such attacks are also insufficient to the extent that they ignore the interactions between treaties and custom.<sup>174</sup> The province of mankind formula is firmly treaty law in a widely subscribed multilateral treaty. The common heritage of mankind principle is part of what we may describe as instant customary law to the extent that it relies on a treaty that is not well subscribed to but which enjoys the traditions of applicability in the law and practice of common spaces –such as in the law of the sea. In other words in spite of low ratification of the Moon Agreement, the common heritage of mankind provision has persuasive and convincing effects under the Chengian instant customary law analysis.

The source of regulatory competence of States over their astronauts and other nationals in space stems from their inherent sovereignty which is then expressed in the biopower over human beings. That biopower over human beings sorts out the incidences of the design and mapping out of outer space activities on Earth

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<sup>173</sup> See *id.* See generally Khan & Haynes, *supra* note 171.

<sup>174</sup> See BIN CHENG, *STUDIES IN INTERNATIONAL SPACE LAW* 136-141 (1997).

and then their implementation in space through outright actions by astronauts, and other persons that may operate in outer space such as tourists.

This article has used the biopower concept in much broader sense to encompass philosophy, sociology, and jurisprudential influences. This is because influences of all these were always in Foucault's use in his writings as well. At the same time the article restricts the exploitative purposes to which both legal jurisdiction and biopower in its expansive form can be pressed in outer space. Biopower must be infused with the duties of the sovereign State to the community of nations and intergenerational equity and the rights of humanity in general. It is biopower that explains and makes intrinsically possible other possible ways of exercising jurisdiction in space. Biopower makes astronauts the legs and arms of the State in space. Thus far, the exercise of biopower is not incompatible with the development of a *lex mercatoria* in space. Just as sovereignty and jurisdiction on Earth has not been intolerant of the principles of the *lex mercatoria* biopower is very much compatible with the regulation of economic life. The future of space regulation and biopower indeed trends towards self-regulatory capacities by subjects. The content of such regulation is also shaped and normalized through technocratic expertise towards liberal capitalism. The emergent *lex mercatoria* shaped by private space actors has so far also not demanded the reduction of biopower perhaps because they cannot presently do so and because the networks of private actors hope to in time utilize State biopower for their own purposes and interests.

To scholars who have not explored the true utility of Foucault's thinking our arguments here would have stretched the notion of biopower well beyond its intended meaning. A limited understanding of the concept of biopower, would limit it to the State wielding law over the physical body to control the population mostly if not solely for criminal infractions. This paper has willfully casts biopower as a broad concept that takes in most if not all regulatory areas. This is because all regulation will eventually and ultimately depend on statist manifestation of power to either enforce them or prescribe them in the first place. Even where States allow diffused sources of regulation such as through bureaucratic or professional networks, as is now seen in the space industries of some nations;

such regulation is still according to the principles of international law delegated *jurisdiction* and subject to the *jurisdiction* and therefore biopower of a particular State for its enforcement. This is why we have chosen to apply biopower to the area of space resources. Although space mining is a power of regulation directed at a resource the proscription and prevention of it by those States that do not allow will depend on biopower at some point on Earth or in space. The allowance or promotion of space mining will also require *jurisdiction* and or biopower to enforce. These incidents clearly impact human behavior, and therefore are included in the Foucault's intended meaning.

As of yet there is no independent source of power or existence of human organization or action in space that escapes the traditional if not primordial sources of Westphalian biopower. The emerging fields of Artificial intelligence and robotic technology may in time create serious problems for established categories of jurisdiction, control and biopower in space. Indeed, current understanding of sovereignty, jurisdiction, control, and biopower and their application to outer space may soon become anachronistic even in the near future. Dramatic changes in national and international space law and policy would occur because of the efforts of organized corporate networks that interact with the use of biopower of States. At any rate the manifestations of biopower in space will have to address new and complex challenges that would make current conundrums seem like child's play. This is even though biopower is already facing considerable difficulties as a tool of analysis today. Elon Musk has for instance, launched an orbiting mannequin in the driver seat of a luxury Tesla Roadster. This car plays a David Bowie song on eternal loop in the eternity of outer space.<sup>175</sup> Who exercises biopower over the placement of a Mannequin in space? Who can arrest and punish a future carjacker of the orbiting Tesla? Does David Bowie's copyright and intellectual property subsist in space and for how long? Did Elon Musk act against sustainability principles by littering the universe with an orbiting Tesla for fun? These are just some of the many questions relating to regulatory oversight in outer space that scholars of Foucault's ideas may need to provide answers for in this century. It is suggested that the mannequin, a

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<sup>175</sup> Ohmer, *supra* note 72, at 348.

nonbiological subject will nevertheless require one State's biopower to allow its emplacement and redress any wrongs, torts, and crimes. This will entail legal, jurisdictional and even sociological connections to that State. That connection is explained by Foucault's biopower and its exercise involves extra legal considerations which include intergenerational, interethnic and even interspecies equities.

# ADDRESSING THE US DOMAIN AWARENESS GAP POSED BY UNIDENTIFIED ANOMALOUS PHENOMENA

*Quinn McKemey\**

## ABSTRACT

This article analyzes how unidentified anomalous phenomena (UAP) expose a significant domain awareness gap for the United States (US) concerning national defense, aviation safety and scientific understanding. Bolstered by reports from elite military aviators and underscored by the incursion of unidentified objects (including one alleged Chinese surveillance balloon) over US airspace in February 2023,<sup>1</sup> UAPs have garnered widespread concern and interest from the public and Congressional members without any formalized regimen for data sharing and analysis. Nearly half of 2022's 366 cases received by the Pentagon's All-Domain Anomaly

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<sup>1</sup> David Vergun, *General Says Chinese Surveillance Balloon Now Over Center of US*, DOD NEWS (Feb. 3, 2023), <https://www.defense.gov/News/News-Stories/Article/Article/3288103/general-says-chinese-surveillance-balloon-now-over-center-of-us/#:~:text=As%20of%20noon%20to-day%2C%20the,on%20the%20ground%2C%20said%20the>.



Resolution Office (AARO) remain unidentified.<sup>2</sup> Addressing public concerns regarding transparency warrants cooperative research between the US government and academia to serve as a central source for gathering and disseminating reliable data, reports, and research. The focus of this article is not on UAP that have prosaic explanations, but rather on reports made by military observers and systems that continue to resist description in conventional terms after repeated attempts to identify them. These reports are often imperfectly studied or otherwise ignored by science and academia due to a lack of sufficient data and enduring taboos. While there are likely multiple explanations for remaining unidentified cases, the number of reports indicating incursions in restricted airspace and highly sensitive defense installations justifies a conduit to research the issue and keep the public appropriately informed of how taxpayer dollars are allocated to investigate.

## I. INTRODUCTION

The goal of this article is to separate the noise of the Unidentified Flying Object (UFO) (and associated visitors from outer space) as a cultural sensation from genuine, and ongoing unidentified anomalous phenomena (UAP) reports that continue to pose a challenge to national defense, aviation safety and scientific understanding. The author recommends that these deficiencies be met with data sharing among stakeholders in the defense, civil government and scientific communities to balance regard for sensitive defense information with public safety and curiosity. At a minimum, the author offers the present work to contribute positively to the serious academic study of UAP without speculating on the causes of the phenomena. As entertaining as the topic may be, it must be stressed that this matter continues to stump the military and intelligence communities we depend on for national security.

The author will use the remainder of this article to elaborate on the following four assertions regarding UAP:

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<sup>2</sup> See U.S. OFFICE OF THE DIR. OF NAT'L INTEL., 2022 ANNUAL REPORT ON UNIDENTIFIED AERIAL PHENOMENA 5 (2022), available at: <https://www.dni.gov/files/ODNI/documents/assessments/Unclassified-2022-Annual-Report-UAP.pdf> [hereinafter DNI 2022 UAP Ann. Rep.].

(1) Truly *unidentified* reports of objects in United States (US) airspace and protected waters do exist and continue to be made by credible—and often technically trained—persons whose testimony would be accepted in a hearing or court of law in any other context. Of the 366 new reports collected by the All-Domain Anomaly Resolution Office (AARO) between January 2021 and August 2022, 46.7% remain unidentified after scrutiny by persons capable of making a commonsense identification.<sup>3</sup>

(2) These genuine unknowns have been imperfectly studied, or otherwise ignored, by broader science and academia due to the lack of data available to the public and enduring stigmas.<sup>4</sup> The challenges should not outweigh the need for academic cooperation and public understanding to inform appropriate policies, especially given recent incursions over US airspace, subsequent engagement from the National Aeronautics and Space Administration (NASA) and the Department of Defense (DoD), and growing public concern.

(3) The significant number of unexplained reports, combined with the absence of robust reporting mechanisms and public access to data, highlights a critical domain awareness gap regarding national defense, aviation safety, and scientific understanding.

(4) An essential step in closing this three-pronged gap would be a collaborative, open-source data repository between federal agencies, local municipalities and civilian scientists that serves as the central authority for gathering and disseminating reliable information, reports and research. Such activity would decrease ambiguity over federal agency jurisdictions, increase transparent data sharing, and accelerate identification of unknown objects in US airspace.

## II. RATIONALE FOR THIS ARTICLE

There needs to be more consensus among scientists, academics, government officials and the public on what UAPs represent. Many describe reports as hoaxes or nonsense, while others are

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<sup>3</sup> *Id.*

<sup>4</sup> See JOSEPH ALLEN HYNEK & JACQUES VALLEE, THE EDGE OF REALITY: A PROGRESS REPORT ON UNIDENTIFIED FLYING OBJECTS 8-9 (1975).

convinced they represent visitors from outer space or interdimensional travelers.<sup>5</sup> By definition, unidentified means *we do not know*, but variability in the reports suggests more than a singular explanation.<sup>6</sup>

Fortunately, the logical and methodological structure of the scientific method has proven effective in allowing us to understand a variety of previously unknown phenomena in nature. These advances have come about from new empirical observations and novel explanation schemes, such as concepts or laws, to encompass them into our understanding.<sup>7</sup> This is how reluctance to accept the findings of Copernicus, Newton, and Darwin as tenets of our worldview were replaced by new frameworks that included them.<sup>8</sup> Assuming we do not know all there is to know about our world and the universe, perhaps the closure of the UAP domain awareness gap requires new understanding and explanation schemes.<sup>9</sup> As the UAP Preliminary Assessment states, “we may require additional scientific knowledge to successfully collect on, analyze and characterize some [UAP].”<sup>10</sup>

The facts of many reports are often circumstantial and anecdotal, though not unlike data in the fields of anthropology, psychology and meteorology.<sup>11</sup> The observations outlined in reports are certainly interesting; many give the reader the impression that the observer indeed witnessed the events as described, made a severe error in identification, or was bereft of their senses and reason. Could this indicate a psychological phenomenon that results in these reports, warranting further engagement from the field of psychology?<sup>12</sup> Perhaps the number of strange objects reported by service members, pilots and radar operators necessitates a sociologists’

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<sup>5</sup> JOSEPH ALLEN HYNEK, *THE UFO EXPERIENCE: A SCIENTIFIC INQUIRY* 13-14 (1972).

<sup>6</sup> See U.S. OFFICE OF THE DIR. OF NAT’L INTEL., *PRELIMINARY ASSESSMENT: UNIDENTIFIED AERIAL PHENOMENA* 3 (2021), available at: <https://www.dni.gov/files/ODNI/documents/assessments/Preliminary-Assessment-UAP-20210625.pdf> [hereinafter UAP Preliminary Assessment].

<sup>7</sup> See HYNEK, *supra* note 5, at 260.

<sup>8</sup> Hanne Andersen & Brian Hepburn, *Scientific Change*, INTERNET ENCYCLOPEDIA OF PHILOSOPHY, <https://iep.utm.edu/scientific-change/> (last visited July 4, 2023).

<sup>9</sup> See HYNEK, *supra* note 5, at 9.

<sup>10</sup> UAP Preliminary Assessment, *supra* note 6, at 6.

<sup>11</sup> HYNEK, *supra* note 5, at 38.

<sup>12</sup> See *id.* at 16-17.

review of the screening process for critical defense personnel? While given fair consideration as possibilities, the occupations, training and experience of the various observers and systems in the UAP Preliminary Assessment study do not support these notions. Despite how strange the reports highlighted in this article and the research are, the pattern spread is somewhat small, whereas hallucinations can vary considerably and cannot be captured on advanced sensor systems.<sup>13</sup>

We must note that ambiguity in the details of a given report does not necessarily indicate a misperception of a known object or attempts at deception. Interviews with witnesses in the 2004 *Nimitz* case and audio from the “Gimbal” and “Go Fast” clips, show that a lack of expression can plague these individuals who are otherwise technically trained in recanting specific minutiae.<sup>14</sup> Especially in cases where there is a high degree of reliability from multiple observers, supported by instruments of equal or greater reliability, we have no reason to dismiss these reports out of hand.<sup>15</sup> The criteria for “believing” or “disbelieving” these types of qualified reports are suddenly on par—“why should we believe them?” is just as valid a question as “why shouldn’t we?”<sup>16</sup> With the level of responsibility entrusted to these various observers, particularly as it relates to national defense, the author tends to trust their accounts as reported, especially when backed up by reliable data collection systems.

Irrespective of any explanation, there are far too many reports from credible observers of various socioeconomic backgrounds worldwide, often supported by reliable systems, to dismiss them entirely. Based on the Air Force’s Project Blue Book files, a possible 5-25% of cases remain unidentifiable or unexplainable.<sup>17</sup> These remaining cases—considered anomalous detections<sup>18</sup>—do not include

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<sup>13</sup> See Flavie Waters et al., *Visual Hallucinations in the Psychosis Spectrum and Comparative Information from Neurodegenerative Disorders and Eye Disease*, 40 SCHIZOPHRENIA BULL. S233, S234 (2014).

<sup>14</sup> 60 Minutes, *Navy Pilots Describe Encounters with UFOs*, YOUTUBE (May 16, 2021), <https://www.youtube.com/watch?v=ZBtMbBPzqHY> (last visited June 15, 2023). Full descriptions of these events can be found *infra* at part VI.

<sup>15</sup> See HYNEK, *supra* note 5, at 22.

<sup>16</sup> *Id.* at 21.

<sup>17</sup> See HYNEK & VALLEE, *supra* note 4, at 21.

<sup>18</sup> See ALL-DOMAIN ANOMALY RESOLUTION OFFICE, <https://www.aaro.mil/> (last visited Sept. 15, 2023).

misperceptions of conventional objects, psychological effects, or hoaxes and will be further defined in the methodology.

### III. CASE METHODOLOGY

The following definitions will serve as a guide for the remainder of the article:

**Account** - the content of a report.

**Report** - a written statement submitted through government channels and made by observers judged psychologically coherent and responsible, describing an event, object, or natural process that cannot be immediately identified.

**Observer** - Individual(s) who make a report and are generally acknowledged to be a reputable person who is reliable, honest in their dealings with others, and accustomed to responsibility; *whose testimony would be accepted in a hearing or court of law in any other context.*

**Unidentified Anomalous Phenomena (UAP)** - reported perception of a light or object whose trajectory, appearance, or luminescence is perplexing to the observer and remains unidentified after scrutiny by persons deemed technically capable of making a commonsense identification.<sup>19</sup>

When discussing UAP for this article, it encompasses only those reports that remain unexplained to trained individuals capable of identifying them—not the vast majority of misperceptions of conventional objects or natural phenomena. For example, the alleged Chinese surveillance balloon that crossed into US airspace in early 2023 would not be considered a UAP given its characteristics and origin are well-defined. However, the failure to detect the balloon and other slow-moving objects lingering near sensitive defense installations underscores the need for increased engagement from multiple disciplines.<sup>20</sup> While many of these reports remain unidentified after serious attempts to solve them, the Pentagon's All-

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<sup>19</sup> See UAP Preliminary Assessment, *supra* note 6, at 3, 5.

<sup>20</sup> See Sascha Brodsky, *The Pentagon is Investigating UFOs That Possibly Turned off Warheads*, POPULAR MECH. (Feb. 23, 2023), <https://www.popularmechanics.com/military/research/a43033115/pentagon-investigating-ufos-nuclear-warheads/>.

Domain Anomaly Resolution Office (AARO) states these “unknowns,” once identified, can be classified into the following five categories:

- (1) **Airborne Clutter:** balloons, birds, civilian drones, or debris.
- (2) **Natural Atmospheric Phenomena:** ice crystals, thermal fluctuations, and weather patterns that sometimes register on radar.
- (3) **US Government or Industry Developmental Programs:** advanced or otherwise classified developmental programs by US entities.
- (4) **Foreign Adversary Systems:** technologies deployed by Russia, China, or other foreign government and non-governmental entities.
- (5) **Other:** genuinely new empirical observations involving unusual flight characteristics or signature management, requiring additional scientific knowledge or advancements to collect on, analyze, or characterize them successfully.<sup>21</sup>

To emphasize credibility in the included reports, single-observer accounts, regardless of the reliability of the witness, were excluded. This practice prevents the possibility of a meritorious observer who made an honest mistake in identifying a known object. The highlighted cases in this article were selected because they meet two essential criteria: 1) the reports describe events that defy prosaic explanations and perhaps warrant further academic and scientific study to understand them regardless of their origin; and 2) due to the credibility of the observers and the reliability of systems that corroborated their accounts, the probability that these events occurred as described is high. While the probability of evidence is high, we cannot establish *certainty* by academic standards. However, a national scientific working group managing a repository of reports and research could establish if a sample size of similar high-probability cases might render compound probability tantamount to certainty.<sup>22</sup>

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<sup>21</sup> UAP Preliminary Assessment, *supra* note 6, at 5-6.

<sup>22</sup> *See, e.g.*, HYNEK, *supra* note 5, at 65-66.

## IV. CHALLENGES

Even considering some of the most perplexing cases, such as those highlighted in this article, there are still significant challenges associated with adequately assessing UAP: digital evidence, enduring stigmas, North American Aerospace Defense (NORAD) tracking practices, and most notably, the paucity of publicly available data, which is exacerbated by poor reporting and the transience of UAPs themselves.

Many critics suggest that photos and videos are required evidence for the existence of UAP, especially in modern times where mobile phones are ubiquitous and have advanced tremendously in photographic capability.<sup>23</sup> Where are the photos and videos? In an age of advanced deep fake technology and computer-generated trickery, these publicly sourced photos and videos are often no more reliable than the individual observer and contribute to ongoing taboos with their unreliability.<sup>24</sup> An abundance of hoaxes and misperceptions requires that we refine our standard of evidence to encompass observations only captured by reliable military or civil aviation systems until other viable methods become commercially vetted and available for use.<sup>25</sup> Some high-quality evidence has been released to the public and authenticated by the DoD.<sup>26</sup> However, many critical data points, specifically size, shape, velocity, propulsion, trajectory, and detection method, remain classified.<sup>27</sup> Indeed, some cell phone photographs taken from the cockpits of military aircraft have been made public and remain unidentified, such as those in Exhibit 1 below.

Developing methods to disseminate that data to an open-source repository without compromising sensitive defense

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<sup>23</sup> See Samson Amore, *Neil Degrasse Tyson Thinks We Should Have Better Pictures of Aliens by Now*, THE WRAP (June 28, 2021), <https://www.thewrap.com/neil-degrasse-tyson-ufos-aliens-tweets-us-pentagon-report/>.

<sup>24</sup> See HYNEK, *supra* note 5, at 65.

<sup>25</sup> For example, a quick internet search will reveal strings of Starlink satellites or the planet Venus are commonly confused for UAP.

<sup>26</sup> Natasha Turak, *Pentagon Declassifies Three UFO Videos Taken by Navy Pilots*, CNBC (Apr. 28, 2020), <https://www.cnbc.com/2020/04/28/pentagon-declassifies-ufo-vid-eos-taken-by-navy-pilots.html>.

<sup>27</sup> See John Greenewald, *Range Fouler Debrief Forms and Reports*, THE BLACK VAULT (Jan. 16, 2023), <https://www.theblackvault.com/documentarchive/range-fouler-debrief-forms-and-reports/>.

information would provide invaluable knowledge for civilian scientists attempting to aid in the classification of unknown objects.



Exhibit 1<sup>28</sup>

Stigma and taboos involving UAP continue to be an impediment to acceptance of the subject for broader study. Decades of portrayals of UAP studies as pseudo-science and media sensationalism of the subject have contributed to disinformation and resulted in a reluctance from science and academia to engage.<sup>29</sup> On one hand, this has led to conspiracy theories of a “cover-up” from camps of true believers and the assertion that UAPs are undoubtedly

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<sup>28</sup> <https://thedebrief.org/pentagon-confirms-leaked-ufo-images-are-authentic/>

<sup>29</sup> See Alexander Wendt & Raymond Duvall, *Sovereignty and the UFO*, 36 POL. THEORY 607, 626 (2008).



extraterrestrial.<sup>30</sup> On the other, a mindset of “debunking” UAPs professes to be rational and scientific but at the same time refuses to accept any evidence that would suggest otherwise.<sup>31</sup> As far back as the 1950s, Dr. J. Allen Hynek would lament the “*it can’t be, therefore it isn’t*” mentality of Air Force brass during his two decades as an astronomical consultant for Project Blue Book.<sup>32</sup> This attitude continues to be pervasive amongst the public, media, science, academia and various sectors of government as evidenced by the Federal Aviation Administration’s (FAA) response to the 2006 Chicago O’Hare International Airport incident, among other cases.<sup>33</sup>

Another ill-conceived notion about UAP is the widespread assumption that such objects do not show up on radar and therefore cannot be codified.<sup>34</sup> In fact, there are countless reports corroborated by radar returns made by civilian and military operators.<sup>35</sup> NORAD is responsible for aerospace control over the US and Canada, possessing the capability to track such objects.<sup>36</sup> Officially, NORAD does not have data related to UAP in North American airspace; however, the system only monitors for, *inter alia*, trajectories of air traffic, ballistic missiles, satellites, and space debris.<sup>37</sup> Since most UAP trajectories do not satisfy these conditions, they are automatically rejected from the data as Uncorrelated Targets (UCTs) without further examination.<sup>38</sup> While these UCTs are not officially

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<sup>30</sup> See Karlyn Bowman, *UFOs and Government Cover-Ups*, AM. ENTER. INST. (Feb. 14, 2023), <https://www.aei.org/politics-and-public-opinion/ufo-and-government-cover-ups/>.

<sup>31</sup> See HYNEK, *supra* note 5, at 193

<sup>32</sup> *Id.* It is worth noting that Dr. Hynek was a professed skeptic who initially sought to debunk the issue. His inability to positively attribute the steady stream of cases for over two decades, while a consultant to Project Blue Book, convinced him of the validity of the phenomenon. Upon his death in 1986, the former skeptic was a leading advocate for serious engagement from science and the public.

<sup>33</sup> See *infra*, part VI.B.

<sup>34</sup> *Id.*

<sup>35</sup> See *infra*, part VI.A & Section VIII.

<sup>36</sup> See generally NORAD AND USNORTHCOM, STRATEGY: EXECUTIVE SUMMARY (March 2021), available at: [https://www.northcom.mil/Portals/28/\(U\)%20NORAD-USNORTHCOM%20Strategy%20EXSUM%20-%20Signed.pdf](https://www.northcom.mil/Portals/28/(U)%20NORAD-USNORTHCOM%20Strategy%20EXSUM%20-%20Signed.pdf).

<sup>37</sup> *Id.*

<sup>38</sup> See Phoebe A. Jackson, *Small Satellite Debris Catalog Maintenance Issues*, PROC. OF NASA’S 4TH ANN. WORKSHOP ON SPACE OPERATIONS APPLICATIONS & RSCH., 696, 699 (1991), <https://ntrs.nasa.gov/api/citations/19910011389/downloads/19910011389.pdf> (defining UTCs and citing NORAD’s data for explanation of USSPACECOM’s catalog).

reported, the research suggests such targets are not rare.<sup>39</sup> Even a slight change in approach to cataloging UCTs with trajectories that match those given in reports could go a long way in providing additional data to a very complex problem. This proved to be the case in the hours after the alleged Chinese surveillance balloon was identified over US airspace.<sup>40</sup> NORAD began tracking smaller objects with slower trajectories which resulted in the shutdown of three other objects in the subsequent weeks.<sup>41</sup>

When it comes to reports themselves, the amount of useable data is deplorable. The data from reports are typically anecdotal and difficult to verify, which does not stand up to scientific scrutiny. In declassified releases, many important details with diminutive relation to overall national security are frustratingly redacted, such as size, shape, color, altitude, velocity and apparent means of propulsion.<sup>42</sup> Hindering complete research is the inability to access information about reports that are still classified.<sup>43</sup> In more recent cases, such as the *Nimitz* and Gimbal reports,<sup>44</sup> first-hand accounts corroborated through a multitude of mediums and reputable sources were able to fill in gaps on cases that were included, but not detailed, in the AAROs 2022 dataset.<sup>45</sup>

More empirical data—in the form of radar data and other advanced sensors—is sorely needed to accurately assess the *nature* of certain UAP cases. This data is currently used to publicly and accurately gauge the position, speed and flight path of civil aircraft, making possible the thousands of flights that occur every day.<sup>46</sup> As expressed in many reports,<sup>47</sup> UAPs have unquestionably been

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<sup>39</sup> HYNEK, *supra* note 5, at 81.

<sup>40</sup> See, e.g., Sanya Mansoor, *Why America's Air Defense Network Failed to Detect the Chinese Spy Balloons*, TIME, (Feb. 10, 2023) <https://time.com/6254681/chinese-balloons-us-air-defense-network-failure/>.

<sup>41</sup> *Id.*

<sup>42</sup> See Greenewald, *supra* note 27.

<sup>43</sup> ROBERT HASTINGS, *UFOS & NUKES: EXTRAORDINARY ENCOUNTERS AT NUCLEAR WEAPONS SITES 15* (2d ed. 2017).

<sup>44</sup> See generally, Kevin H. Huth, et al., *Estimating Flight Characteristics of Anomalous Unidentified Aerial Vehicles*, 21 Entropy 939 (2019). See also Jan Tegler & Cat Hofacker, *Mystery of the "Damn Things"* AEROSPACE AMERICA (Oct. 31, 2019), <https://aerospaceamerica.aiaa.org/features/mystery-of-the-damn-things/>. For details on the events, see *infra* part VI.

<sup>45</sup> See DNI 2022 UAP Ann. Rep, *supra* note 2, at 5.

<sup>46</sup> HASTINGS, *supra* note 43, at 20.

<sup>47</sup> See UAP Preliminary Assessment, *supra* note 6, at 2.

captured on radar by the FAA and branches of the military over the decades but much of the data, even qualitative aspects such as size, shape, trajectory, altitude and velocity, remains unavailable for public scientific scrutiny.<sup>48</sup>

The lack of a formalized reporting structure beyond local municipalities for civilian observations contributes to the unsatisfactory state of the data. Some of the best reports come from scientifically or technically trained people who can rule out several conventional explanations at the gate and provide serious credibility to the events. These individuals are often reluctant to come forward to avoid publicity and maintain their anonymity in the face of inevitable scrutiny and official apathy.<sup>49</sup> Further, even the accounts of the most technically trained individuals are complicated by their inability to explain reported objects in common sense terms.<sup>50</sup> These reports often describe events that are so spontaneous and unusual that it is likely difficult to observe and report at the same time.<sup>51</sup>

Beyond that, UAPs collectively appear to be beyond control in an experimental sense. Reports indicate they are transient, highly localized, and unscheduled—not unlike meteorites.<sup>52</sup> The observer is then only able to collect data circumstantially. In most cases, these observers are unprepared and unable to make a dispassionate analysis. This heavily restricts any attempt to test and replicate results. The author invites discussion over what constitutes quality data in this particular field but analyzing remaining unidentified reports for clustering around size, shape, color, velocity, altitude, and apparent means of propulsion is a sensible place to start.

## V. VAGUE PATTERNS CAN BE DERIVED FROM PUBLICLY AVAILABLE REPORTS

### A. *Patterns Among Observers*

Observers come from various walks of life and seem to describe genuine events, representing a fantastic experience that they

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<sup>48</sup> See Greenewald, *supra* note 27.

<sup>49</sup> See UAP Preliminary Assessment, *supra* note 6, at 4.

<sup>50</sup> See HYNEK, *supra* note 5, at 28.

<sup>51</sup> *Id.* at 28-29.

<sup>52</sup> *Id.* at 261.

struggle to comprehend and explain.<sup>53</sup> Typically, the most articulate and coherent reports come from people who appear to be genuinely surprised by their experience after serious attempts at applying a logical explanation have been made.<sup>54</sup> The incident has the “reality” of an actual event (like a crime scene, car crash or combat scenario) but the observer is unable to provide a rational explanation or description.<sup>55</sup> Often, this is after the observer has exhibited the step-by-step application of an explanation only to realize each conventional description is inadequate.<sup>56</sup> While most people in these positions of responsibility have the competent vocabulary to describe tangible events relevant to their roles, observers like those highlighted in this article have a sense of bewilderment and are at a loss for descriptive terms.<sup>57</sup>

### *B. Patterns Among Reports*

If UAPs are imagined or hallucinated, it is noteworthy that these misperceptions are restricted to a series of relative patterns.<sup>58</sup> The narrow spectrum of quality UAP reports is precisely why they can and should be studied. If reports varied wildly, then it would only further complicate the study of UAP.

The stark lack of resemblance in the reports to any depictions of spacecraft in science fiction and pop-culture suggests that genuine UAP cases do not represent some manifestation of media intake.<sup>59</sup> Household favorites, such as *Star Wars*, *Star Trek*, and even fringe sci-fi material, depict craft with discernible flight features and means of propulsion.<sup>60</sup> Despite their fictional advancements beyond our technology, they still tend to obey the laws of physics as we understand them. All things considered, these depictions often resemble the technology of the present imposed on the future but still conform to our current explanation schemes.

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<sup>53</sup> *See id.* at 14-18.

<sup>54</sup> *Id.*

<sup>55</sup> *Id.*

<sup>56</sup> HYNEK, *supra* note 5, at 14-18.

<sup>57</sup> *Id.*

<sup>58</sup> *Id.*

<sup>59</sup> HASTINGS, *supra* note 43, at 38.

<sup>60</sup> Elizabeth Howell & Callum McKelvie, *The Greatest Spaceships of Science Fiction*, SPACE.COM. (Jan. 31, 2022), <https://www.space.com/42312-greatest-spaceships-of-science-fiction/2.html>.

Bona fide UAP reports, on the other hand, tend to cluster around size, shape, color, velocity and means of propulsion, depicting objects that can rapidly accelerate and make right-angle turns without slowing down or producing sound. They are often reported as having few or no discernable flight features or means of propulsion and in some cases do not appear to be affected by laws of gravity or inertia as we understand them.<sup>61</sup> These unusual flight characteristics are observed repeatedly in civilian cases as well. The most striking aspect to observers, as noted in their reports, is often the color or speed of the object. When appearing as a light, the source is often extremely intense and of very vivid color but can range across the color spectrum.<sup>62</sup> Reports made by observers and corroborated by radar describe flight trajectories that are usually controlled, with many describing vertical flight paths or exhibiting a wobbling or tumbling motion when moving horizontally.<sup>63</sup> Vertical trajectories are commonly reported at the conclusion of an encounter.<sup>64</sup> In rare instances such as the *Nimitz* case (discussed *infra* at part. VI.A) and others tracked on radar, the motion of an object is reported to be coincidental with maneuvers of nearby aircraft. Clustering in government cases can be more accurately determined if such reports were stripped of sensitive defense information and made available for scientific analysis. At a minimum, this could allow investigators to rule out several prosaic explanations at the gate.

As indicated in historical reports and the Office of the Director of National Intelligence's (ODNI) Preliminary Assessment, some UAPs are reported to display a degree of signature management.<sup>65</sup> In military reports, this is evidenced by jamming aircraft radar or "breaking" its lock on the target.<sup>66</sup> In civilian cases, interference with electric circuits within close proximity is sometimes reported.<sup>67</sup> In the 1957 Levelland, Texas sightings, this physical effect

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<sup>61</sup> UAP Preliminary Assessment, *supra* note 6, at 5; HYNEK, *supra* note 5, at 13.

<sup>62</sup> HYNEK, *supra* note 5, at 56.

<sup>63</sup> *Id.* at 63.

<sup>64</sup> *See, e.g., id.* at 69, 82, 120.

<sup>65</sup> UAP Preliminary Assessment, *supra* note 6, at 5, 6.

<sup>66</sup> Weaponized, *Episode #27 – Lt. Cmdr. Chad Underwood / The Man Who Filmed the Tic Tac UFO*, at 53:41, JEREMY KENYON LOCKYER CORBELL (Aug. 17, 2020), <https://www.weaponizedpodcast.com/episodes-1/episode-number-27>.

<sup>67</sup> *See* HYNEK & VALLEE, *supra* note 4, at 19.

was reported by ten separate observers who were geographically and occupationally independent of each other, including truck drivers, police officers, a fire marshal, and a college student.<sup>68</sup> Similar effects have been documented in countless other reports, with recent legislation requiring AARO to study these aspects and provide briefings to Congress.<sup>69</sup>

Despite decades of Hollywood films featuring UFOs as the public generally perceives them, the most puzzling and compelling cases bear almost no resemblance to what we see in pop-culture,<sup>70</sup> and have instead formed a separate but relatively consistent pattern for more than 75 years. It stands to reason that if reports resulted from the depictions of visitors from outer space in the media, these tropes would eventually surface among the reports or in discernible trends. Perhaps they do in cases of hoaxes or hallucinations, but the level of credibility is incomparable to the cases that ultimately remain unidentified to the AARO and broader public. Instead, the most compelling cases are well-evidenced and detail events that repeatedly resist attempts to explain them. In these quality reports, you do not find the observer stating, “[i]t was just like you see in the movies.” The more standard description is some variation of “I have never seen anything like it before or since.”<sup>71</sup>

## VI. HIGHLIGHTED CASES

The observers submitting reports to the AARO represent a cross-reference of reliable and technically trained individuals who are critical to national defense,<sup>72</sup> including military aviators, radar

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<sup>68</sup> See HYNEK, *supra* note 5, at 140-147.

<sup>69</sup> H.R. 4350, 117th Cong. § 1652 (2022).

<sup>70</sup> The one apparent exception would be Stephen Spielberg’s film, *Close Encounters of the Third Kind* (Columbia Pictures 1977). However, Jacques Vallee and J. Allen Hynek both were heavily consulted for the film after their participation for over two decades in government UAP research. The film is unique in that the appearance and behavior of UAP differ significantly from other depictions in science fiction and wider pop-culture. See Meet J. Allen Hynek, the Astronomer Who First Classified UFO “Close Encounters,” HISTORY, <https://www.history.com/news/j-allen-hynek-ufos-project-blue-book> (last visited Nov. 18, 2023), Chantel Tattoli, *Jacques Vallee Still Doesn’t Know What UFOs Are*, WIRED.COM (Feb. 10, 2022) <https://www.wired.com/story/jacques-vallee-still-doesnt-know-what-ufos-are/>.

<sup>71</sup> See, e.g., HYNEK, *supra* note 5, at 15.

<sup>72</sup> See ALL-DOMAIN ANOMALY RESOLUTION OFFICE, <https://www.aaro.mil/> (last visited September 15, 2023).

operators and commanding officers.<sup>73</sup> Data sharing within government has expanded AARO reporting to include information from other agencies, such as the Federal Aviation Administration (FAA). While these reports will be the focus of this article, there are countless public reports made by civilian pilots, police officers, farmers, intelligence officers, and civil scientists.<sup>74</sup> Reports are by no means limited to any subset of occupations. However, the observers in the highlighted cases were often considered the most credible in the absence of any formal reporting infrastructure. In terms of the observers themselves, the occupations and corroboration of their reports speak to their credibility; however, given the lack of publicly available documentation about these incidents, some aspects of are unverifiable and serve as a historical account of events. Considering most professional historians employ similar approximations, these reports should be viewed in the same manner and considered to be reliable but incomplete.<sup>75</sup>

#### A. USS *Nimitz* (2004)

The 2004 *Nimitz* Carrier Group encounter is arguably the most well-known report in the AARO's collection data—and perhaps the most compelling in terms of unusual flight characteristics displayed and the number of credible witnesses and systems used to capture the event.<sup>76</sup> In November 2004, the USS *Nimitz* and USS *Princeton* tracked as many as 100 UAPs in restricted military airspace over two weeks.<sup>77</sup> Senior Chief Operations Specialist Kevin Day managed radar operations, detecting groups of UAPs in low Earth orbit before dropping from 80,000 feet to 28,000 feet with variation in altitude among objects.<sup>78</sup> Several targets were tracked on

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<sup>73</sup> See DNI 2022 UAP Ann. Rep., *supra* note 2, at 5-6.

<sup>74</sup> HYNEK, *supra* note 5, at 97 n.2.

<sup>75</sup> HASTINGS, *supra* note 43, at 21.

<sup>76</sup> See Kevin H. Knuth, et al., *Estimating Flight Characteristics of Anomalous Unidentified Aerial Vehicles in the 2004 Nimitz Encounter*, 33 PROCEEDINGS 26, 26 (2019).

<sup>77</sup> *Id.* at 27.

<sup>78</sup> *Id.*

radar subsequently dropping from 28,000 feet to sea level in 0.78 seconds<sup>79</sup> without producing a sonic boom.<sup>80</sup>

On November 14, CDR Dave Fravor of the elite Naval flight squadron, the Black Aces, took off with another F/A-18F Super Hornet for a training exercise in the area.<sup>81</sup> After the *USS Princeton* picked up a UAP on radar, the two aircraft were vectored to the location to investigate.<sup>82</sup>

All four pilots spotted a white, unmanned aerial vehicle (UAV), shaped like a large cylindrical butane tank, or a tic-tac candy, moving erratically back and forth, almost like a bouncing ping-pong ball making instantaneous changes in direction without changing speed. The tic-tac UAV was estimated to be about the size of an F-18, about 40–50 feet in length and 10–15 feet wide but had no apparent flight surfaces or means of propulsion, and its movement had no apparent effect on the ocean surface as one would expect from something like rotor wash from a helicopter.<sup>83</sup>

As Fravor flew down to get a closer look, the object appeared to show awareness of his presence by flying up to mirror the pilot's movements before instantly accelerating as if it was "shot out of a rifle."<sup>84</sup> The seasoned aviator pointed out that a jet flying at three times the speed of sound will still take 10 to 15 seconds to be out of sight, yet this object seemed to disappear instantaneously.<sup>85</sup> Moments later, Fravor received a transmission from the *Princeton* that they had picked up the same tic-tac on radar at an encrypted, pre-determined rendezvous point for the pilots some sixty miles away.<sup>86</sup>

Upon Fravor's return to the *Nimitz*, pilot Chad Underwood was sent to capture video of the object using the F/A-18's forward-

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<sup>79</sup> *Id.*

<sup>80</sup> Matthew Phelan, *Navy Pilot Who Filmed a UFO Speaks: 'It Wasn't Behaving by the Laws of Physics'*, INTELLIGENCER (Dec. 19, 2019), <https://nymag.com/intelligencer/2019/12/tic-tac-ufo-video-q-and-a-with-navy-pilot-chad-underwood.html>.

<sup>81</sup> Knuth et al., *supra* note 76, at 29.

<sup>82</sup> *Id.*

<sup>83</sup> *Id.*

<sup>84</sup> 60 Minutes, *supra* note 14.

<sup>85</sup> Knuth et al., *supra* note 76, at 29.

<sup>86</sup> See Knuth et al., *supra* note 76, at 30 (Calculating the probability of selecting this particular point out of all locations in a 60-mile radius, to within one mile, is 00.0088%).



looking infrared (FLIR) camera.<sup>87</sup> FLIR cameras are highly adept at identifying aircraft, yet Underwood was unable to discern any tail, wings, or exhaust plume within close range of the tic-tac object.<sup>88</sup> An experienced FLIR operator, Underwood cited the lack of propulsion as an immediate indicator that this was not a conventional aircraft.<sup>89</sup> Moreover, airspeed, altitude, and heading measurements on the FLIR began to behave erratically once he was able to lock on the moving object, which jammed his radar and broke the FLIR lock before rapidly accelerating out of the frame.<sup>90</sup> The US considers jamming of military radar during peacetime as an act of war.<sup>91</sup>

The UAP encounters with the *Nimitz* Carrier Group in 2004 are among the most well-documented reports in the AARO case files. Two weeks were spent tracking and documenting the objects, a process that included the shutdown and recalibration of both ships' radar systems to ensure these tracks were not errors.<sup>92</sup> Four elite aviators were able to observe the object at close range while others corroborated the unique flight characteristics with sensor data and FLIR footage.<sup>93</sup> Using the publicly available sensor information and size estimates from eyewitness accounts, a research group at the University at Albany's (SUNY) Department of Physics determined that the tic-tac object accelerated out of the FLIR frame at a range from 75g to 5000g without giving off any heat, sonic boom or air disturbance.<sup>94</sup> For comparison, the human body cannot endure more than 25g for a single second, and some of the most advanced aircraft maintain structural integrity only up to 13g.<sup>95</sup> Energy estimates to accomplish such a feat exceed the nuclear energy

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<sup>87</sup> See Phelan, *supra* note 80.

<sup>88</sup> Weaponized, *supra* note 66, at 16:40.

<sup>89</sup> *Id.*

<sup>90</sup> Underwood further explained that FLIR weapon systems are designed for maintaining a lock on targets performing aggressive maneuvers by saying, "If it were to just veer off to the left, the FLIR would've been able to track that with no problem. But it shot off at an instant acceleration that the FLIR just is not [Underwood laughs] not engineered to track." *Id.* at 12:30. The pilot stated that it usually takes at least 3-5g of acceleration to break a FLIR lock. *Id.* at 13:00.

<sup>91</sup> *Id.* at 53:41.

<sup>92</sup> Phelan, *supra* note 80.

<sup>93</sup> *Id.*

<sup>94</sup> Knuth et al., *supra* note 76, at 26.

<sup>95</sup> *Id.* at 39.

production of the US by a factor of ten.<sup>96</sup> The extreme data collected from this incident suggests the information is either erroneous, fabricated, or a genuine depiction of advanced flight capability.<sup>97</sup> The USS *Nimitz* incident is just one of the 171 remaining unexplained reports made by military aviators in recent years.<sup>98</sup> The possibility of misperception of conventional objects has been thoroughly investigated, yet the case remains unexplained.<sup>99</sup>

### B. Chicago O'Hare International Airport (2006)

During the afternoon hours of November 7, 2006, a “saucer-like” object was visually observed hovering above one of the busiest airports in the world<sup>100</sup> by over fifteen airline pilots, mechanics, and management personnel.<sup>101</sup> The event was estimated to last about eighteen minutes, concluding with the object departing rapidly in a vertical trajectory through the clouds, leaving behind a perfect circle of similar size that persisted for another fourteen minutes.<sup>102</sup> When the story broke in *The Chicago Tribune*, the FAA and United Airlines stated they had no knowledge or records of the reported occurrence.<sup>103</sup> Only after Freedom of Information Act (FOIA) requests revealed three separate telephone inquiries, a written notation in the FAA tower’s “Daily Record of Facility Operation,” and significant radio chatter discussing the object, did the agency and

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<sup>96</sup> See *id.* at 33. Even accounting for a large margin for error suggests the energy requirements for the described maneuver are far beyond known current capacity.

<sup>97</sup> *Id.* at 26.

<sup>98</sup> DNI 2022 UAP Ann. Rep., *supra* note 2, at 5.

<sup>99</sup> *Id.*

<sup>100</sup> Michelle Baran, *These Are the World's Busiest Airports—A List That Marks a Comeback for Several Major International Hubs*, AFAR (Apr. 6, 2023), [https://www.afar.com/magazine/the-busiest-airports-in-the-world#:~:text=Chicago's%20O'Hare%20International%20Airport,Pudong%20International%20Airport%20\(74%20million\)](https://www.afar.com/magazine/the-busiest-airports-in-the-world#:~:text=Chicago's%20O'Hare%20International%20Airport,Pudong%20International%20Airport%20(74%20million).).

<sup>101</sup> Ryan Smith, *O'Hare UFO Sighting in 2006 One of the Most Famous Reported*, CHI. TRIB. (Mar. 20, 2013), <https://www.chicagotribune.com/redeye/ct-redeye-xpm-2013-03-20-37880251-story.html>.

<sup>102</sup> RICHARD F. HAINES ET AL., NAT'L AVIATION REPORTING CTR. ON ANOMALOUS PHENOMENA, REPORT OF AN UNIDENTIFIED AERIAL PHENOMENON AND ITS SAFETY IMPLICATIONS AT O'HARE INTERNATIONAL AIRPORT ON NOVEMBER 7, 2006 38 (May 14, 2007), [https://static1.squarespace.com/static/5cf80ff422b5a90001351e31/t/5d02ec731230e20001528e2c/1560472703346/NARCAP\\_TR-10.pdf](https://static1.squarespace.com/static/5cf80ff422b5a90001351e31/t/5d02ec731230e20001528e2c/1560472703346/NARCAP_TR-10.pdf).

<sup>103</sup> Leslie Kean, *UFOs: Investigating the Unknown*, NAT'L GEOGRAPHIC (Feb. 24, 2023), Season 1, Ep. 4, at 26:20-27:41, <https://www.nationalgeographic.com/tv/shows/ufo-investigating-the-unknown>.

United Airlines concede that they did receive reports about the event.<sup>104</sup>

According to the FAA, nothing appeared on the radar during this time and location, nor was it seen by air traffic controllers.<sup>105</sup> The head spokesperson for the FAA attributed it to the reflection of airport lights on the cloud deck, despite confirmation that all exterior lights were inactive between 4-4:30 PM when the observations occurred.<sup>106</sup> A subsequent statement pointed to an obscure weather anomaly known as a hole-punch cloud. This explanation was deemed inadequate considering the event requires conditions below freezing and the weather was approximately 50 degrees Fahrenheit during the time of observation.<sup>107</sup>

This case was explicitly selected because the identity of the object in question *does not matter* regarding aviation safety. The fact that a perceived object can be visually observed over one of the world's busiest airports for an extended duration while not registering on radar constitutes a significant potential flight safety risk. As one of the witnesses later remarked, "I knew no one would make a false call like that. But if somebody was bouncing a weather balloon or something else over O'Hare, we had to stop it because it was in very close proximity to our flight operations."<sup>108</sup> This is poignant considering what we have learned from the 9/11 attacks and recently disclosed incursions of foreign balloons.<sup>109</sup> From the pilot's perspective, any uncertainty in an operating space, particularly during a takeoff or landing scenario, could range from distracting to dangerous. Yet the FAA—charged with the responsibility of public aviation safety—offered grossly oversimplified explanations that were not based on the facts of the event.<sup>110</sup> From another observer disgruntled by the lack of action: "If we see a funny-looking bag all damn hell breaks loose, but park a funny silver thing a few hundred

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<sup>104</sup> HAINES ET AL., *supra* note 102, at 17.

<sup>105</sup> *Id.*

<sup>106</sup> Kean, *supra* note 103, at 29:35.

<sup>107</sup> *Id.*

<sup>108</sup> Smith, *supra* note 101.

<sup>109</sup> David Vergun, *Chinese Surveillance Balloons Global in Scope, Says Official*, DOD NEWS (Feb. 13, 2023), <https://www.defense.gov/News/News-Stories/Article/Article/3297104/chinese-surveillance-balloons-global-in-scope-says-official/>.

<sup>110</sup> *Id.*

feet above a busy airport and everyone tries to hush it up.”<sup>111</sup> Reporting unusual activity in areas of dense air traffic is encouraged in any other context. At the time of writing however, the FAA still has no internal procedure for reporting UAPs. According to their website, official protocol requires pilots and employees to submit reports to civilian research organizations or local law enforcement.<sup>112</sup>

### C. “Gimbal” & “Go Fast” (2014-2015)

Over six months in 2014 and 2015, Navy pilots conducting exercises in restricted airspace off the coast of Virginia Beach were picking up dozens of unidentified targets on their newly upgraded Raytheon APG-79 radar systems.<sup>113</sup> According to one of the pilots, Lt. Ryan Graves, these tracks would appear almost daily and poke along at about 100mph.<sup>114</sup> What struck him as unusual was that they could seemingly do this all day, every day with no apparent need to refuel.<sup>115</sup> Initially, the pilots believed the targets were the result of a malfunction with the new radar systems, considering some of the targets would change altitude or direction with impressive agility.<sup>116</sup> This theory was discredited when the pilots began corroborating the radar tracks by picking them up on electro-optical and infrared sensors on the F-18/F’s FLIR system.<sup>117</sup>

FLIR sensors are so precise that “you can almost see the rivets” of a conventional aircraft.<sup>118</sup> Observers from the *Roosevelt* Carrier Strike Group have publicly stated that what they observed through the sensors did not have any distinct outlines or apparent means of propulsion that are characteristic of known aircraft.<sup>119</sup> Moreover, no exhaust plumes, wings, or tail were discernible and

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<sup>111</sup> David Bates, *The O’Hare Field UFO Remains a Great Case*, MEDIUM (Sept. 17, 2021) <https://medium.com/on-the-trail-of-the-saucers/why-skeptical-inquirers-debunking-of-the-o-hare-field-ufo-is-ridiculous-428d4ee077ad>.

<sup>112</sup> FAA Order JO 7110.65, ch. 9, § 8.

<sup>113</sup> Tegler & Hofacker, *supra* note 44.

<sup>114</sup> The Kevin Rose Show, *UFOs - Advanced Navy Fighter Pilot, Ryan Graves* (Dec. 3, 2019) <https://podcast.kevinrose.com/ufos-advanced-navy-fighter-pilot-ryan-graves/> (last visited Aug. 20, 2023).

<sup>115</sup> *Id.*

<sup>116</sup> Tegler & Hofacker, *supra* note 44.

<sup>117</sup> *Id.*

<sup>118</sup> *Id.*

<sup>119</sup> 60 Minutes, *supra* note 14.

instead gave off an aura, suggesting a bright infrared emission from the source.<sup>120</sup>

One pilot informed Graves that he had a near miss with one of the objects. He described how the object did not appear on radar but only noticed it as it passed within 400 feet of him and another F/18 and nearly caused a collision.<sup>121</sup> It was described as a “partially transparent cube with a sphere inside.”<sup>122</sup> This “near miss” was one of the 11 included in the UAP Task Force’s (UAPTF) 2019 Preliminary Assessment,<sup>123</sup> and later highlighted during hearings held by the US House Intelligence Subcommittee on Counterterrorism, Counterintelligence, and Counterproliferation in 2022.<sup>124</sup>

AT-FLIR footage of the objects leaked in 2017 and were later authenticated by the Pentagon as genuine unknowns.<sup>125</sup> Titled “Gimbal” and “Go Fast”, the former features a top-shaped object moving at high speed against the wind and turning 90 degrees on its axis.<sup>126</sup> “Go Fast” captures an unknown object moving at high speed.<sup>127</sup> Both videos were captured on the same day and are incomplete without their priceless audio, which features the same baffled responses typical among UAP observers. It is almost easy to forget that these are highly-trained, technical professionals who are not easily excited or fooled.

The tracks were so common and of such high concern that a Notice to Airmen (NOTAM) was given to pilots to make them aware of the hazard.<sup>128</sup> Once again, here is a case in which multiple observers and systems of high credibility captured unidentified objects that continuously resisted explanation over an extended timeframe. The observations occurred over a large radius of

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<sup>120</sup> Tegler & Hofacker, *supra* note 44.

<sup>121</sup> *Id.*

<sup>122</sup> *Id.*

<sup>123</sup> UAP Preliminary Assessment, *supra* note 6, at 6.

<sup>124</sup> *Hearing on Government Investigation of UFOs Before the H. Intel. Subcomm. on Counterterrorism, Counterintelligence and Counterproliferation* (statements of Scott Bray, Deputy Director, Off. of Naval Intel., at 59:33) (May 17, 2022) <https://www.c-span.org/video/?520133-1%2Fhearing-government-investigation-ufos>.

<sup>125</sup> Turak, *supra* note 26.

<sup>126</sup> Helene Cooper, et al., *Glowing Auras and ‘Black Money’: The Pentagon’s Mysterious U.F.O. Program*. N.Y. TIMES (Dec. 16, 2017) <https://www.nytimes.com/2017/12/16/us/politics/pentagon-program-ufo-harry-reid.html>.

<sup>127</sup> *Id.*

<sup>128</sup> Kevin Rose Show, *supra* note 114.

airspace and were too removed from the mainland to be civilian or commercial drones.<sup>129</sup> Weather patterns could not be responsible for observations over the six-month duration and all sensor systems were investigated for possible malfunction.<sup>130</sup> In subsequent interviews, Graves stated similar sightings by his colleagues became a daily occurrence “for at least a couple years.”<sup>131</sup> The author cannot attempt to apply a common sense explanation to these events if the pilots and intelligence officials, capable of making a determination, are at an equal loss.

## VII. IMPLICATIONS

### A. *Misperceptions of Known Objects (Airborne Clutter or Natural Atmospheric Phenomena)*

It is possible that the average remaining “unknowns” in the AARO dataset could be identified as airborne clutter or natural atmospheric phenomena with additional investigation and data. However, only one of the 144 unknowns in the UAPTF’s Preliminary Assessment from 2021 was able to be positively identified: it was a balloon.<sup>132</sup> Out of the 366 newly-identified reports included in the follow-up assessment, 163 are balloons or balloon-like entities, 26 are characterized as Unmanned Aircraft Systems (UAS), and six others are attributed to clutter.<sup>133</sup> The other 46.7% of cases remain unidentified after numerous attempts to apply an explanation, which suggests a severe shortcoming in either US sensor capability to detect known objects or US ability to collect sufficient data to characterize reports.<sup>134</sup> In the event some UAPs turn out to be naturally occurring, perhaps their apparent flight characteristics should be studied for potential technological advances in the same sense that other observations in nature (such as birds and

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<sup>129</sup> *Id.*

<sup>130</sup> *Id.*

<sup>131</sup> Reis Thebault, *For Some Navy Pilots, UFO Sightings were an Ordinary Event*, WASH. POST (May 17, 2021) <https://www.washingtonpost.com/nation/2021/05/17/ufo-sightings-navy-ryan-graves/>.

<sup>132</sup> Kevin Rose Show, *supra* note 114.

<sup>133</sup> DNI 2022 UAP Ann. Rep, *supra* note 2, at 5.

<sup>134</sup> *Id.*

insects) are used to inform biomimicry principles in aircraft design.<sup>135</sup>

*B. Proprietary Advanced Technology (US Developmental Programs or Foreign Adversary Systems)*

Proprietary advanced technology remains a possibility in many of the reports, however, AARO is authorized to compare state-of-the-art developments to reports without revealing the nature of the undisclosed programs to the public.<sup>136</sup> In more recent cases such as the *Nimitz*, the sightings occurred during the middle of military exercises, and the UAPTF assessment indicates these reports continue to occur regularly during planned operations.<sup>137</sup> While it could be argued that this possibly suggests a classified project's way of testing the responses of pilots in real-time, CDR Fravor ruled out this possibility as it would likely be a breach of government methodologies.<sup>138</sup> Numerous experienced pilots have echoed this assertion.<sup>139</sup> Moreover, the multitude of reports in the UAPTF's assessment indicates this is not a unique occurrence. While this does nothing to explain the civilian sightings, why would an undisclosed government program display this technology in seemingly obvious public domains? More specifically, why would a foreign entity do this over American soil and risk the project's secrecy?

In terms of foreign adversary systems, the Soviet Union was arguably the only other power during the post-World War era capable of developing technology with advanced flight capability. The brazen incursions on US defense installations of vital security interest over the same period would be commensurate to a secret developmental program, foreign or domestic, flaunting their

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<sup>135</sup> ADSactly. *Is it a Bird? Is it a Plane? Biomimicry in Airplanes*. MEDIUM (Jan. 28, 2018), <https://medium.com/@adsactly/is-it-a-bird-is-it-a-plane-biomimicry-in-airplanes-9862d331df2e#:~:text=Birds%20have%20stream-lined%20shapes%20so,when%20they%20are%20in%20motion>.

<sup>136</sup> Testimony on Mission, Activities, Oversight, and Budget of the All-Domain Anomaly Resolution Office: Hearing Before the Subcomm. on Emerging Threats and Capabilities of the S. Comm. On Armed Serv. 118th Cong. 26-27 (2023) (statement of Dr. Sean Kirkpatrick, Dir. of AARO).

<sup>137</sup> UAP Preliminary Assessment, *supra* note 6, at 4.

<sup>138</sup> Lex Fridman Podcast, *David Fravor: UFOs, Aliens, Fighter Jets, and Aerospace Engineering*, at 2:48:24 (Sept. 8, 2020), [https://www.youtube.com/watch?v=aB8zcAttP1E&ab\\_channel=LexFridman](https://www.youtube.com/watch?v=aB8zcAttP1E&ab_channel=LexFridman).

<sup>139</sup> 60 Minutes, *supra* note 14.

technology in front of multiple trained observers. Assessments during that time indicate there was no evidence the Soviets had developed any aircraft that could match the reported maneuvers of UAP sightings.<sup>140</sup> Scientists in the 1950s were well aware that the US was spending billions of dollars on projects attempting to break the speed of sound.<sup>141</sup> It was assessed as highly unlikely that this money was spent while the capabilities described in reports were concealed, or that the US had been surpassed technologically by the Russians, British, or others.<sup>142</sup> Further, assessments as early as 1947 concluded that the human body was unable to withstand the violent maneuvers associated with some UAP reports.<sup>143</sup> Considering UAVs were not deployed en masse until the Vietnam War,<sup>144</sup> this indicates nearly two decades where foreign adversary systems and drones as explanations for UAP are all but ruled out. Considering that numerous reports indicate the US government historically found no evidence of UAP being foreign adversary systems, any revelation to the contrary would suggest an embarrassing lapse in national security and intelligence. Such an instance would undoubtedly require an overhaul in enhanced efforts to collect more robust data. This is perhaps best highlighted by the public revelation of the extent of the Chinese balloon program that had previously gone undetected, resulting in the shootdown of four objects over North American airspace in two weeks, a move many consider to be an overcorrection.<sup>145</sup>

### C. Other

In the event some UAP represent genuinely new empirical observations, the most baseline implication would be that we may require additional scientific knowledge or advancements to understand them.<sup>146</sup> This could be as small as encompassing new

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<sup>140</sup> *Id.*

<sup>141</sup> *Id.*

<sup>142</sup> *Id.*

<sup>143</sup> *Id.*

<sup>144</sup> *A Brief History of Drones*, IMPERIAL WAR MUSEUMS, <https://www.iwm.org.uk/history/a-brief-history-of-drones> (last visited July 31, 2023).

<sup>145</sup> Brad Dress, *How China's Spy Balloon Spurred a Rapid Shift in US Sky Patrol*, THE HILL (Feb. 16, 2023), <https://thehill.com/policy/defense/3859855-how-chinas-spy-balloon-spurred-a-rapid-shift-in-us-sky-patrol/>.

<sup>146</sup> UAP Preliminary Assessment, *supra* note 6, at 6.



concepts in our explanation schemes or, at the extreme, result in us reworking our explanation schemes altogether. For example, Newton's 2nd Law rules out very rapid acceleration for bodies of appreciable mass.<sup>147</sup> Moreover, the AARO tracks for transmedium observations, or reported instances of bodies of mass transitioning between mediums (such as air & sea) with apparent no changes in velocity.<sup>148</sup> Considering the nature of some reports, such as the *Nimitz* case, it may be as difficult to conceive an appropriate explanation scheme for their events as it would have been for Newton to accept quantum mechanics in his time.<sup>149</sup> Since most UAP captured on multiple sensors represent physical objects, we need more data to determine *how* they accomplish remarkable feats such as those described in the highlighted cases.

Irrespective of origin, should some UAPs be determined to be physical craft, that would suggest they are probably very well-resourced with advanced energy technologies to accomplish their in-flight capabilities. The ramifications are astounding in terms of the possibility of sustained energy far beyond our current capability.<sup>150</sup> This understanding would have a far-reaching impact on our current economic and geopolitical structure.<sup>151</sup> Determining the origin of UAP is a separate question entirely, but even if one case is determined to be non-human, it would undoubtedly be one of the most significant discoveries in recorded history, shaking the foundation of our current belief systems.<sup>152</sup> These possibilities must be met with a high bar of evidence. The author does not wish to speculate further, other than that if this is even a remote possibility, it is worth serious scientific and academic inquiry considering millions of dollars are spent blasting radio waves into remote areas of space, which has produced no empirical evidence of intelligent life to date.<sup>153</sup>

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<sup>147</sup> HYNEK, *supra* note 5, at 38.

<sup>148</sup> DNI 2022 UAP Ann. Rep, *supra* note 2, at 3, 11.

<sup>149</sup> HYNEK, *supra* note 5, at 28-29.

<sup>150</sup> See Alexander Wendt & Raymond Duvall, *Sovereignty and the UFO*, 36 POL. THEORY 607, 616 (2008).

<sup>151</sup> See *id.* at 619.

<sup>152</sup> See *id.* at 626-29.

<sup>153</sup> Paul Sutter, *Why Are We Still Searching for Intelligent Alien Life?* SPACE.COM (Nov. 9, 2021) <https://www.space.com/why-humans-search-intelligent-alien-life-SETI>.

### VIII. RECOMMENDATIONS: CLOSING THE DOMAIN AWARENESS GAP

Characterizing UAP requires a multidisciplinary approach, necessitating a national scientific working group to serve as a central source for gathering and disseminating reliable information, reports, and research in coordination with federal agencies. The purpose of this group would be to serve the following functions:

Streamline and consolidate data collection and processing by establishing an open-source data repository among several states or entities to collaborate on a major statistical study to search for clustering or trends. It may be necessary to use the United Nations in efforts to uniformly codify data for a broader international study.<sup>154</sup> Regardless, this will involve the development of consistent terminology and the systemization and organization of data. Determinations for UAP must be rigorously defined and stripped of unrelated aspects, and defense information should be redacted for any sensitive material without compromising the integrity of data points that are critical for characterization.<sup>155</sup>

This hypothetical organization would include a research team with the capability to react quickly to new and significant reports.<sup>156</sup> To improve reports in newer cases, color wheels can be used to reference colors, or brightness can be translated to lumens by approximation to known sources.<sup>157</sup> Modernized artificial intelligence and machine learning algorithms can be used to sift through data and rule out conventional explanations with more efficiency as the pool of data increases. A massive statistical study could then use this data to determine any evidence of a new empirical observation by analyzing various sample sizes. On a smaller scale, this commission could provide a detailed analysis of roughly two to three quality cases per month and keep the public informed, through non-sensational channels, of what is known and what is not regarding high-profile reports.<sup>158</sup>

Analogs for this type of activity do exist outside of the US. The French space agency Centre National d'Études Spatiales (CNES)

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<sup>154</sup> See HYNEK, *supra* note 5, at 214.

<sup>155</sup> *Id.* at 242-43.

<sup>156</sup> *Id.* at 201-202.

<sup>157</sup> *Id.* at 77-78.

<sup>158</sup> HYNEK, *supra* note 5, at 197.

has operated variations of GEIPAN (translates to unidentified aerospace phenomenon research and information group), which has collected, analyzed, and archived reports from civilians and aviators since 1977.<sup>159</sup> The agency follows a strict methodology of collecting observer testimony, employing multiple disciplines to conduct follow-up investigations, and anonymizing the case file before informing the witness of its classification.<sup>160</sup> Cooperation between GEIPAN, branches of the military, local law enforcement, and the public allows the organization to characterize most of their reports with high confidence. As of February 2023, 32.7% of their 3,012 archived cases remain unidentified due to insufficient data, and another 3.3% (99 reports) remain unexplainable after months or years of detailed investigations.<sup>161</sup>

During the “wave” of UAPs that occurred in the skies above Belgium from 1989-1991, the Belgian Air Force received over 2,000 reports of similar objects from geographically independent observers near Brussels and the Ardennes forest region.<sup>162</sup> The entire case is outlined by Major General Wilfried De Brouwer, retired Chief of Air Operations for the Belgian Air Force, in a 2010 novel by *New York Times* investigative journalist Leslie Kean.<sup>163</sup> To enhance transparency, the Belgian Air Force supported SOBEPS, a scientific research group investigating the case, by providing registered air traffic patterns over areas of observation and obliging requests for radar data.<sup>164</sup> Of the total reports, 650 were thoroughly investigated. Some 500 remain unexplainable.<sup>165</sup> While these analogs do not guarantee the characterization of genuine unknowns, the efforts are emblematic of the approach required to increase transparency and data sharing with the public.

NASA and the FAA are two civil government agencies poised to aid in such a proposed effort. NASA’s UAP Independent Study

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<sup>159</sup> Centre National d’Etudes Spatiales (CNES), *GEIPAN - Groupe d’Études et d’Informations sur les Phénomènes Aérospatiaux Non Identifiés*, (June 8, 2015), <https://geipan.cnes.fr/en/geipan-0>.

<sup>160</sup> *Id.*

<sup>161</sup> *Id.*

<sup>162</sup> See LESLIE KEAN, *UFOs: GENERALS, PILOTS, AND GOVERNMENT OFFICIALS GO ON THE RECORD* 32-34 (2010).

<sup>163</sup> See *id.* at 17-40.

<sup>164</sup> *Id.* at 37.

<sup>165</sup> *Id.* at 34.

Team's final report found no evidence of extraterrestrial life as the cause of unexplained cases, but found the threat to US airspace safety "self-evident."<sup>166</sup> The agency recommended using earth-imaging assets and commercial remote sensing capabilities to aid in data collection, and promised deeper integration with the Aviation Safety Reporting System (ASRS) administered for the FAA.<sup>167</sup>

The FAA is already tasked with regulating all aspects of civil aviation to ensure the safety and efficiency of the system.<sup>168</sup> The Office of Accident Investigation & Prevention is the investigative authority for all aircraft accidents and works to mitigate flight risks through data collection, information sharing, and risk analysis.<sup>169</sup> There is a clear overlap between the Office of Accident Investigation & Prevention's responsibilities and the in-flight safety risks posed by UAP.<sup>170</sup> Perhaps this office, or one similar, could serve as the non-sensational channel by which research, data, and reports regarding UAP in civil aviation can be disseminated to the public. The public already looks to other three letter agencies, such as the CDC and FDA, as trusted, non-partisan entities that inform the populace on known matters.

To facilitate this, minor amendments are required to the 2021 FAA Order JO 7110.65Z on Air Traffic Control. Section 8 on UFO Reports has two provisions that do not provide for any formalized reporting mechanism by requiring any reports to be directed to data collection centers outside of the FAA or with local law enforcement if there is concern over life or property endangerment.<sup>171</sup> Any empirical data, such as radar returns, could be more easily shared with the public without fear of revealing classified capabilities (a significant impediment in military cases). New efforts to streamline government reporting of UAP have included encompassing FAA

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<sup>166</sup> NASA UNIDENTIFIED ANOMALOUS PHENOMENA INDEPENDENT STUDY TEAM REPORT 4 (2023) [hereinafter UAPIST Report].

<sup>167</sup> *Id.*

<sup>168</sup> *About FAA*, FEDERAL AVIATION ADMINISTRATION (FAA), <https://www.faa.gov/about> (last visited July 31, 2023).

<sup>169</sup> Office of Accident Investigation & Prevention, *Office of Accident Investigation & Prevention*, FAA, [https://www.faa.gov/about/office\\_org/headquarters\\_offices/avs/offices/avp#:~:text=The%20Office%20of%20Accident%20Investigation,Transportation%20Safety%20Board%20\(%20NTSB%20\)](https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/avp#:~:text=The%20Office%20of%20Accident%20Investigation,Transportation%20Safety%20Board%20(%20NTSB%20)) (last visited July 31, 2023).

<sup>170</sup> *See* UAP Preliminary Assessment, *supra* note 6, at 3, 6.

<sup>171</sup> FAA Order JO 7110.65, ch. 9, § 8, [https://www.faa.gov/air\\_traffic/publications/atpubs/atc\\_html/chap9\\_section\\_8.html](https://www.faa.gov/air_traffic/publications/atpubs/atc_html/chap9_section_8.html) (last visited July 31, 2023).

reports, but the existing legislation lacks clarity on how those internal reports are provided if they are already directed to outside entities. Allowing these reports to be collected in-house can ensure proper follow-up is taken by FAA authorities responsible for civilian safety in our skies. As more becomes known about the nature of UAP, investigative responsibility can be delegated as needed to the appropriate federal agency.

## IX. CONCLUSION

The cases primarily explored were highlighted because they meet two essential criteria: 1) the reports describe events that defy prosaic explanations and perhaps warrant further academic and scientific study to understand them regardless of their origin. 2) Due to the credibility of the observers and the reliability of systems that corroborated their accounts, the probability that these events occurred as described is high. After a thorough review of the reports and data, the author submits that there are three possible conclusions:

- (1) All UAPs are explainable as known objects or natural phenomena, therefore further study is not warranted.
- (2) UAP reports do not contain enough data upon which to base a final conclusion, therefore further study is warranted in pursuit of obtaining better data to determine if they are undisclosed developmental programs (foreign or domestic) or new observations (in nature or otherwise).
- (3) UAP reports constitute empirically new observations that may require new explanation schemes or scientific knowledge to explain them, therefore further study is warranted.

Despite the small percentage of anomalous cases, the author argues that the patterns of high strangeness frequently reported by credible individuals suggest that all UAP are not explainable as known objects or natural phenomena. It is unlikely that all can be dismissed as foreign adversary systems or USG developmental programs given the repeated patterns for 75 years and a lack of translation of those capabilities into emergent technologies over the given timeframe. Nonetheless, there is no evidence that these UAPs

are extraterrestrial in origin.<sup>172</sup> However, *more data is desperately needed before any final determinations on the cause of unexplained reports can be made.* As explored in this article, numerous studies attempted by various organizations worldwide continue to have sizable portions of cases that are still unidentified. The question remains: if all reported UAPs have conventional explanations, how do they continue to resist characterization after such detailed attempts at investigation? These genuine unknowns continue to challenge the US from national security, aviation safety, and scientific perspectives.

Given that many of these reports occur in areas of security interest to the US, the taxpayer—who funds the nation’s defense—deserves to be adequately informed of the knowns and unknowns. After four objects were shot down over US airspace in quick succession, the public has a right to demand identification and evidence of the origin of each incident. Getting an acceptable answer will require the assembly of a multidisciplinary scientific working group in cooperation with associated government agencies that can centralize reporting and data collection to assess the presence of new empirical observations and transparently inform the public of what those may indicate.

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<sup>172</sup> UAPIST Report, *supra* note 166, at 24.

# UNCONTROLLED REENTRY: A COMPARISON OF THE CHINESE AND US LEGAL AND POLICY APPROACHES

*Jessica Sewell\**

## ABSTRACT

The uncontrolled reentry of the People's Republic of China's (PRC or China) Long March 5B rockets pose preventable risks to persons and property on Earth's surface. When it comes to the reentry of space objects, China's comparatively underdeveloped legal and regulatory regime provides insufficient protection to the public, particularly when compared to the United States (US) regulatory system. The US and international community should call on China to improve its practices with respect to reentry, establish meaningful regulation of launch and reentry activities and continue to promote public safety as global launch cadences increase.

## I. INTRODUCTION

The United States (US) and People's Republic of China (PRC or China) are both sophisticated players in outer space launch activities, together accounting for 78% of global space launches in

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2022.<sup>1</sup> As global launch cadences increase, so too do potentially harmful impacts of space launches and reentries.<sup>2</sup>

One emerging concern is the uncontrolled reentry of large space launch vehicle components from Earth's orbit. In recent years, China's Long March 5B rockets have reentered Earth's atmosphere in uncontrolled, unpredictable manners. Because Long March 5B is particularly large, uncontrolled reentry of the rocket body could cause potentially catastrophic damage were it to impact a populated area. In fact, after the Long March's reentry in May 2020, debris from the rocket body struck two villages in the Ivory Coast, thankfully only damaging buildings.<sup>3</sup> One year later, another Long March 5B core stage reentered the atmosphere, its debris crashing into the Indian Ocean.<sup>4</sup> At the time, the two rocket stages were the "heaviest objects to reenter in an uncontrolled manner" since 1991.<sup>5</sup> Despite a clear trend toward "deorbit maneuvers" and controlled reentry on the international stage, and despite condemnation from the international community, China has continued to launch its Long March 5B rocket and allow the rocket body to reenter Earth's orbit in an uncontrolled fashion, exposing people and property on the Earth's surface to collision risk.

This article analyzes US and Chinese domestic space law and policy, as well as international law, in the context of the case study of China's recent Long March 5B launches. Part I provides a historical overview of uncontrolled reentry more generally, international reactions to uncontrolled reentry and China's Long March 5B's uncontrolled reentry. This section also briefly describes the geopolitical situation between the US and China in 2023. Part II of this article summarizes applicable international, US and Chinese laws, regulations and guidelines as they apply to uncontrolled reentry. This part includes a comparative review of the regulatory regimes

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<sup>1</sup> Alexandra Witze, *2022 Was a Record Year for Space Launches*, 613 NATURE 426 (Jan. 19, 2023), <https://doi.org/10.1038/d41586-023-00048-7>.

<sup>2</sup> See Michael Byers et al., *Unnecessary Risks Created by Uncontrolled Rocket Reentries*, 6 NATURE ASTRONOMY 1093, 1095 (Sept. 2022), <https://www.nature.com/articles/s41550-022-01718-8>. The terms "reentry" and "re-entry" are used somewhat interchangeably in scholarship and legislation on this topic. For this this article, I will use the spelling favored in US law and regulations: reentry.

<sup>3</sup> Byers, *supra* note 2, at 1093.

<sup>4</sup> *Id.*

<sup>5</sup> *Id.*



(if any) that have developed in both China and the US with respect to registration of launch activities and reentry requirements. Part III examines applicable US policy toward domestic space launch and China's space program, as well as similar policies within China, and how these policies may encourage or inhibit the development of reentry capabilities that promote public safety. In Part IV, I propose recommendations for the US, China and the international community to address the concerns arising from uncontrolled reentry. And finally, Part V concludes this analysis and sets forth proposed next steps for the mitigation of risks relating to uncontrolled reentry.

## II. OVERVIEW AND HISTORICAL BACKGROUND

### A. *Historical Context*

Space launches are an inherently dangerous activity, and most space launches result in the reentry of some portion of the space vehicle into Earth's atmosphere.<sup>6</sup> Throughout the history of crewed and uncrewed spaceflight, components of satellites, space launch vehicles, orbital telescopes and even space stations have de-orbited and fallen to Earth in an unpredictable, uncontrolled fashion, causing consternation—and damage—to people and property on Earth's surface.<sup>7</sup> In the early days of the space age, little heed was paid to the potential impacts of reentering space objects on Earth. During the Apollo era, the National Aeronautics and Space Administration (NASA) regularly left the upper stages of the Saturn V launch vehicle in low Earth orbit to reenter in an uncontrolled fashion, even though the masses of the Saturn V upper stages were approximately half that of the core stage of the Long March 5B.<sup>8</sup> Indeed, in the US and elsewhere, the potential harms associated with uncontrolled reentry were not given much weight until the late 1970s. In 1979, the US space station Skylab was unable to maintain its orbit

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<sup>6</sup> *See id.*

<sup>7</sup> *See, e.g., Satellite Reentry: Manipulating the Plunge*, AEROSPACE CORP., (May 5, 2018), <https://aerospace.org/article/satellite-reentry-manipulating-plunge> [hereinafter *Aerospace Corp.*].

<sup>8</sup> Andrew LePage, *Rockets Falling from Orbit: The Saturn V That Launched NASA's Skylab*, DREW EX MACHINA (July 31, 2022), <https://www.drewexmachina.com/2022/07/31/rockets-falling-from-orbit-the-saturn-v-that-launched-nasas-skylab/>.

and disintegrated in the atmosphere upon reentry, spreading debris across the Indian Ocean and parts of Australia. As Skylab reentered, the National Aeronautics and Space Administration (NASA) performed a “deorbit maneuver,” where a “space object with propulsive capability can be commanded to execute one burn or a series of burns to lower its orbit so that the object will reenter at a specific location”<sup>9</sup>—preferably one far away from people and property on the ground. While there were no injuries from Skylab, the Australian town of Esperance charged NASA a fee of \$400 for littering<sup>10</sup>—as was their right under the Liability Convention.<sup>11</sup> NASA never made the payment, which speaks to the relative difficulty of enforcing international law.<sup>12</sup>

### *B. China’s Space Program and the Long March 5B*

China’s rocket technology has existed in one form or another for more than eight hundred years.<sup>13</sup> Against the background of the Cultural Revolution, China launched its first satellite, the Dong Fang Hong-1, on a Long March (*changzheng*) One vehicle in 1970.<sup>14</sup> As the 1958 Soviet launch of Sputnik “encouraged” the development of the US space program, establishment of NASA and formation of national space law in the US, so too did Sputnik inspire the modern Chinese space age.<sup>15</sup> The Long March rocket series has since proceeded to complete more than 400 launch missions over the past five decades,<sup>16</sup> making China a leading player in the global space

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<sup>9</sup> Aerospace Corp., *supra* note 7.

<sup>10</sup> Mike Wall, *The Biggest Spacecraft Ever to Fall Uncontrolled from Space*, SPACE.COM (May 5, 2021), <https://www.space.com/13049-6-biggest-spacecraft-falls-space.html>.

<sup>11</sup> Convention on the International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 UST. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention].

<sup>12</sup> See Wall, *supra* note 10.

<sup>13</sup> The first Chinese “rockets” were tubes of gunpowder attached to bamboo arrows, which were fired from a bow and would explode upon impact. These “rockets” were used as early as the late tenth century in the Song Dynasty (960-1279). See JOAN JOHNSON-FREESE, *THE CHINESE SPACE PROGRAM: A MYSTERY WITHIN A MAZE* 43 (1998); see also *Rockets of Ancient China*, CHINACULTURE.ORG, [http://en.chinaculture.org/created/2005-07/21/content\\_70826.htm](http://en.chinaculture.org/created/2005-07/21/content_70826.htm) (last visited Nov. 11, 2023).

<sup>14</sup> Wei Long, *China Celebrates 30th Anniversary of First Satellite Launch*, SPACEDAILY.COM (Apr. 25, 2000) <https://www.spacedaily.com/news/china-00u.html>.

<sup>15</sup> See JOHNSON-FREESE, *supra* note 13, at 45.

<sup>16</sup> Andrew Jones, *China’s Long March Rocket Family: History and Photos*, SPACE.COM (Apr. 12, 2022), <https://www.space.com/china-long-march-rockets-family>.

launch industry. The fifth iteration of the Long March rocket series, Long March 5B, is China's first heavy lift launch vehicle.<sup>17</sup> This single-stage rocket is 187 feet long, 16 feet in diameter, and has a lift capacity of 31,000 pounds to up to geosynchronous orbit (GEO).<sup>18</sup> The Long March 5B was designed specifically for delivering modules of China's space station, the Tiangong (heavenly palace), into orbit.<sup>19</sup> However, in recent years the Long March 5B rocket body has made high-profile, uncontrolled reentries back to Earth's surface. Uncontrolled reentries of China's Long March 5B, specifically, occurred in May 2020,<sup>20</sup> May 2021,<sup>21</sup> July 2022,<sup>22</sup> and November 2022.<sup>23</sup>

These reentries are a problem. The Long March 5B rocket bodies are some of the "heaviest objects to reenter in an uncontrolled manner"<sup>24</sup> in modern history. When particularly large, intact rocket bodies (like those of the Long March 5B) return to Earth, "a substantial fraction of their mass survives the heat of atmospheric reentry as debris," posing significant casualty risks for people and property on the ground.<sup>25</sup> Moreover, disproportionate impacts of such reentry are experienced by non-spacefaring nations:

[t]he distribution of rocket body launches and reentries leads to the casualty expectation (that is, risk to human life) being disproportionately borne by populations in the Global South, with major launching states exporting risk to the rest of the world... Those national governments whose populations are being put at risk should demand that major spacefaring states

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<sup>17</sup> See Qin Tong et. al., *Development of China's New Generation Launch Vehicles*, 38 Chinese J. Space Sci. 593, 593 (2018), <http://english.cssar.cas.cn/ns/NU/201809/W020180906583001107643.pdf>.

<sup>18</sup> Jones, *supra* note 16.

<sup>19</sup> *Id.*

<sup>20</sup> See Byers, *supra* note 2, at 1093.

<sup>21</sup> See Steve Gorman, *US Space Command Tracks Chinese Rocket for Uncontrolled Reentry from Orbit*, REUTERS (May 5, 2021), <https://www.reuters.com/lifestyle/science/us-space-command-tracks-chinese-rocket-uncontrolled-reentry-orbit-2021-05-06/>

<sup>22</sup> See Andrew Jones, *Long March 5B Rocket Stage Makes Fiery Uncontrolled Reentry over Indian Ocean*, SPACENEWS (July 30, 2022), <https://spacenews.com/long-march-5b-rocket-stage-makes-uncontrolled-reentry-over-indian-ocean/>

<sup>23</sup> See Andrew Jones, *Long March 5B Rocket Reenters over Pacific Ocean After Forcing Airspace Closures in Europe*, SPACENEWS (Nov. 4, 2022), <https://spacenews.com/long-march-5b-stage-reenters-over-pacific-ocean-after-forcing-airspace-closures-in-europe/>

<sup>24</sup> Byers, *supra* note 2, at 1093.

<sup>25</sup> *Id.*

act, together, to mandate controlled rocket reentries, create meaningful consequences for non-compliance and thus eliminate the risks for everyone.<sup>26</sup>

While an argument could be made that China's Long March 5B launches are merely reflective of past global practice, as the US paid little heed to the potential impacts of reentering Saturn V upper stages during the Apollo era, it bears mentioning that in 2023, "allowing rocket bodies to reenter in an uncontrolled manner is increasingly becoming a choice rather than a technological limitation."<sup>27</sup> According to astrophysicist Jonathan McDowell of the Harvard-Smithsonian Center for Astrophysics, "standard practice" in the aerospace industry requires that rocket stages either be "built with a booster to steer it into a safe landing point in the water after it reenters Earth's atmosphere," or be "built with a rocket stage with some kind of stabilization system and a restartable engine whereby you can slow it down and turn it 180 degrees to land in the ocean."<sup>28</sup> The Long March 5B was not designed or built with either capability, "[a]nd so it's just left in orbit the old-fashioned way to reenter uncontrolled and that is very unusual nowadays,"<sup>29</sup> McDowell says. According to McDowell, by continuing to use a rocket that reenters the atmosphere uncontrolled, China is "deliberately just not caring."<sup>30</sup> Indeed, other nations have criticized China's risk appetite in allowing Long March 5B bodies to return to Earth in an uncontrolled fashion and for "imposing the reentry risks of its rockets onto the world."<sup>31</sup>

Furthermore, China recently demonstrated that it does have access to controlled reentry technology. On May 8, 2023, China Aerospace Science and Technology Corporation (CASC) announced that a reusable test spacecraft successfully returned to its

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<sup>26</sup> *Id.*

<sup>27</sup> *See id.* at 1095.

<sup>28</sup> Passant Rabie, *Uncontrolled Reentry: Why China "Just Not Caring" is a Huge Problem for Space*, INVERSE (May 3, 2021)(quoting Jonathan McDowell), <https://www.inverse.com/science/long-march-5b-uncontrolled-reentry>.

<sup>29</sup> *Id.*

<sup>30</sup> *Id.*

<sup>31</sup> *See* Byers, *supra* note 2, at 1093.

scheduled landing site after 276 days in orbit.<sup>32</sup> While little is known about the spacecraft and its technology's potential application to heavy-lift rockets like the Long March 5B, this accomplishment indicates that China's uncontrolled reentries—especially any that occur in the future—are not necessarily due to technological limitations.

### C. *International Response to Uncontrolled Reentries*

In the 1970s, Skylab's reentry was an international media event, triggering fear,<sup>33</sup> inspiring satire<sup>34</sup> and spurring the international community to consider the potential impacts of uncontrolled reentry if such events were to occur with more frequency. The European Space Agency (ESA) held a workshop on the reentry of space debris in 1983 in response to Skylab's reentry.<sup>35</sup> Likewise, the US later passed laws and implemented regulations to limit the hazards related to reentering space vehicles, which are discussed below under in Part III.C.2.

Since reentering space debris poses a hazard to people and property on Earth, the international community is pushing for increased adoption of controlled reentry procedures. Controlled reentry "implies that a space object can be made to impact a desired location on the Earth's surface."<sup>36</sup> Controlled reentries "usually target a remote ocean area that is uninhabited," so that the "risk

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<sup>32</sup> Andrew Jones, *China's Mystery Reusable Spaceplane Lands after 276 Days in Orbit*, SPACENEWS (May 8, 2023), <https://spacenews.com/chinas-mystery-reusable-spaceplane-lands-after-276-days-in-orbit/>.

<sup>33</sup> See, e.g., Aerospace Corp., *supra* note 7.

<sup>34</sup> See, e.g., Tom Shales, *Please, Mr. Skylab: The Greatest Hits on Earth*, WASH. POST (July 10, 1979), <https://www.washingtonpost.com/archive/lifestyle/1979/07/10/please-mr-skylab-the-greatest-hits-on-earth/7fd747aa-e503-43e4-aa12-d402c688fb40/>; Jim Carrier, *Some Find Skylab Good for "Skylaughs"*, KOKOMO TRIB. 37 (July 8, 1979), <https://www.newspapers.com/image/2604784/?fcfToken=eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJmcmVILX-eyJmcmVILXZpZ2MDQ3ODQsImhhdCI6MTY4MDk5MzE3NywiZXhwIjoxNjg5MDc5NTc3fQ.y0EdBOM7RVvcZRVvcZTGU5liWqs2dporFWuRLF4sbf4>.

<sup>35</sup> ESA Space Debris Off., *ESA's Annual Space Environment Report* (2023), [https://www.sdo.esoc.esa.int/environment\\_report/Space\\_Environment\\_Report\\_lat-est.pdf](https://www.sdo.esoc.esa.int/environment_report/Space_Environment_Report_lat-est.pdf).

<sup>36</sup> Russell P. Patera, *Hazard Analysis for Uncontrolled Space Vehicle Reentry*, 45 J. SPACECRAFT & ROCKETS 1031, 1031 (2008).

associated with a successful controlled reentry is essentially zero.”<sup>37</sup> As awareness of the risks associated with space debris and uncontrolled reentry has grown, the international community has witnessed “increased usage for controlled reentry as disposal strategy,” and “controlled reentry” has been described by ESA as a preferred methodology for the deorbit of space vehicles.<sup>38</sup> In fact, in 2021 ESA reported a marked increase in controlled reentry of space objects from orbit,<sup>39</sup> showing that more States are attempting to adhere to international guidelines.

#### D. Overview of US-China Relations in 2023

*“A trade war, semiconductors, human rights: in recent years, the US-China relationship has been rocked by successive geopolitical crises that have strained the dynamic between two of the world’s most powerful countries.”<sup>40</sup>*

Instances of tension between the US and China have increased in recent years, particularly with respect to outer space. On January 11, 2007, China launched a ballistic missile that collided with, and destroyed, a non-operational Chinese weather satellite.<sup>41</sup> This direct ascent antisatellite (ASAT) test created the largest cloud of

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<sup>37</sup> *Id.*

<sup>38</sup> ESA Space Debris Office, *ESA’s Annual Space Environment Report* (2021), [https://www.sdo.esoc.esa.int/environment\\_report/Space\\_Environment\\_Report\\_latest.pdf](https://www.sdo.esoc.esa.int/environment_report/Space_Environment_Report_latest.pdf).

<sup>39</sup> *See id.* at 7. “Between 40 and 90% of rocket bodies reaching end-of-life during the current decade in the LEO protected region in a non-compliant orbit attempt to comply with space debris mitigation measures. Between 30% and 80% do so successfully, with the compliance trend linearly increasing. Between 40% and 50% of the rocket bodies delivering payloads in or near the GEO protected region during the last decade were in compliance with space debris mitigation measures. Between 85% and 100% of all payloads reaching end-of-life during the last decade in the GEO protected region attempt to comply with space debris mitigation measures. Between 60% and 90% do so successfully, with the compliance trend asymptotically increasing.”

<sup>40</sup> Emily Feng & Lexie Schapitl, *How a Chinese “Spy Balloon” Prompted the US to Scour the Skies*, NPR (Feb. 14, 2023), <https://www.npr.org/2023/02/14/1156731462/china-spy-balloon-timeline-key-dates>.

<sup>41</sup> *See* Brian Weeden, *2007 Chinese Anti-Satellite Test Fact Sheet*, SECURE WORLD FOUND. (Nov. 23, 2010), [https://swfound.org/media/9550/chinese\\_asat\\_fact\\_sheet\\_updated\\_2012.pdf](https://swfound.org/media/9550/chinese_asat_fact_sheet_updated_2012.pdf). While orbital space debris is an important topic in current space law discourse, this paper will focus exclusively on debris that collides with the Earth’s surface.

space debris ever tracked<sup>42</sup> and sparked international outcry.<sup>43</sup> The 2007 test also signaled to the US considerable progress—and potential threats—arising from China’s space program and its capabilities.

In February 2022, Zhao Lijian, spokesperson for China’s Ministry of Foreign Affairs, claimed that China was required to maneuver its Tiangong space station twice in 2021 to avoid close approaches by SpaceX Starlink satellites.<sup>44</sup> Zhao noted that “[a]fter the incidents, China’s competent authorities tried multiple times to reach the US side via e-mail, but received no reply.”<sup>45</sup> The US, on the other hand, disputed China’s claim in a note verbale delivered to the UN Secretary-General.<sup>46</sup> The note verbale similarly highlighted concerns with respect to US-China communications channels:

... the United States urges all nations, in particular those with human spaceflight missions, to provide updated contact information on designated entities authorized to engage in timely exchanges of appropriate information on on-orbit human spacecraft operations, in particular those entities that are

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<sup>42</sup> *See id.*

<sup>43</sup> *See* Carin Zissis, *China’s Anti-Satellite Test*, COUNCIL ON FOREIGN RELATIONS (CFR) (Feb. 22, 2007), <https://www.cfr.org/background/chinas-anti-satellite-test>, detailing outcry from Japan (“In the days after the Chinese test, Japanese Prime Minister Shinzo Abe charged Beijing with violating the United Nations’ 1967 Outer Space Treaty, which bans the use of weapons of mass destruction in space and which China ratified in 1983”); the United States (“If China and the United States both took out each other’s satellites in a conflict, the Americans would lose far more”); India (within two weeks of Beijing’s test, India’s air force announced intentions to protect the country’s space operations (Space.com) by setting up an aerospace command); and even Russia (“Moscow condemned the Chinese test, but Sergei Ivanov, Russia’s former defense minister, tempered the reaction by referring to earlier Soviet and US tests, saying, “It is not China that opened up Pandora’s box.”).

<sup>44</sup> *Foreign Ministry Spokesperson Zhao Lijian’s Regular Press Conference on February 10, 2022*, Ministry of Foreign Affairs of the People’s Republic of China (Feb. 10, 2022), [https://www.fmprc.gov.cn/mfa\\_eng/xwfw\\_665399/s2510\\_665401/2511\\_665403/202202/t20220210\\_10640952.html](https://www.fmprc.gov.cn/mfa_eng/xwfw_665399/s2510_665401/2511_665403/202202/t20220210_10640952.html).

<sup>45</sup> *Id.*

<sup>46</sup> *Note Verbale Dated 28 January 2022 from the Permanent Mission of the United States of America to the United Nations (Vienna) Addressed to the Secretary-General*, U.N. Doc. A/AC.105/1265 (Jan. 28, 2022). [https://www.unoosa.org/oosa/en/ocsadoc/data/documents/2022/aac.105/aac.1051265\\_0.html](https://www.unoosa.org/oosa/en/ocsadoc/data/documents/2022/aac.105/aac.1051265_0.html).

responsible for adopting precautionary and response measures for crewed missions.<sup>47</sup>

Together with legal restrictions like the Wolf Amendment (discussed in Part IV.A), lack of clear channels of communication have made it difficult for the US and China to exchange information on issues of public safety and have at times triggered avoidable geopolitical escalation.

For example, a similar breakdown in communications occurred in February 2023, when the US shot down a Chinese balloon that entered US airspace in violation of international air law.<sup>48</sup> When US officials attempted to contact their Chinese counterparts for an explanation of the balloon's presence in US airspace, China indicated that their side had,

after verification, repeatedly informed the US side of the civilian nature of the airship and conveyed that its entry into the US due to *force majeure* was totally unexpected. The Chinese side has clearly asked the US side to properly handle the matter in a calm, professional and restrained manner.<sup>49</sup>

On the other hand, the US Pentagon spokesperson Brigadier General Pat Ryder called out the balloon as a “high-altitude surveillance balloon” that was “clearly” intended for surveillance purposes.<sup>50</sup> The US proceeded to shoot down the balloon and sanction six civilian Chinese aerospace companies that it accused of ties to China's military space program.<sup>51</sup> Unsurprisingly, the US-China relationship has not since improved.

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<sup>47</sup> *Id.*

<sup>48</sup> Feng & Schapitl, *supra* note 40.

<sup>49</sup> *The Foreign Ministry Issues Statement on the US Claim of Downing a Chinese Unmanned*, Ministry of Foreign Affairs of the People's Republic of China (Feb. 5, 2023), [https://www.fmprc.gov.cn/mfa\\_eng/zxxx\\_662805/202302/t20230205\\_11019871.html](https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/202302/t20230205_11019871.html).

<sup>50</sup> US Dep't of Def., *Transcript: Senior Defense Official Holds a Background Briefing on High-Altitude Surveillance Balloon* (Feb. 2, 2023), <https://www.defense.gov/News/Transcripts/Transcript/Article/3287204/senior-defense-official-holds-a-background-briefing-on-high-altitude-surveillance/>.

<sup>51</sup> Additions to the Entity List, 88 Fed. Reg. 9389 (Feb. 14, 2023) (to be codified at 15 C.F.R. pt. 744), <https://www.govinfo.gov/content/pkg/FR-2023-02-14/pdf/2023-03193.pdf>.



## III. APPLICABLE LEGAL FRAMEWORK

A. *International Space Law*

“Generally, international space law falls into two categories: (1) binding or normative instruments such as treaties, standards, and national regulations, and (2) non-binding agreements which are used to convey voluntary, non-normative and/or aspirational ideals that may be too difficult to achieve international consensus on.”<sup>52</sup> The United States and China have signed treaties that form the basis of international space law; therefore, both countries are subject to international law in pursuing space activities (including reentry of rocket bodies).

First, both China and the US have signed the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, commonly known as the Outer Space Treaty.<sup>53</sup> Under Article III of the Outer Space Treaty, signatories agree to “carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding.”<sup>54</sup> Article VI of the Outer Space Treaty provides for State Parties to the Treaty to bear “international responsibility for national activities in outer space.”<sup>55</sup> Article VII in turn provides that:

“[e]ach State Party to the Treaty that launches or procures the launching of an object into outer space, including the Moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is *internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the*

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<sup>52</sup> Sophie Goguichvili et. al., *The Global Legal Landscape of Space: Who Writes the Rules on the Final Frontier?*, WILSON CENTER (Oct. 1, 2021), <https://www.wilsoncenter.org/article/global-legal-landscape-space-who-writes-rules-final-frontier>.

<sup>53</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 UST. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

<sup>54</sup> *Id.* at art. III.

<sup>55</sup> *Id.* at art. VI.

*Earth*, in air or in outer space, including the Moon and other celestial bodies.”<sup>56</sup>

Based on the text of Article VII of the Outer Space Treaty, there is no question that China would be “internationally liable” for any damage caused by a deorbiting rocket body to people or property on Earth.

Second, the Convention on Registration of Objects Launched into Outer Space<sup>57</sup> (Registration Convention), which both the US and China are party, requires launching States to register space objects “launched into earth orbit or beyond” with the Secretary-General of the United Nations.<sup>58</sup> Launching States are required to furnish various information with the registration, including the name of the launching State, the date and location of launch, and basic orbital parameters.<sup>59</sup> However, there is no requirement in the Registration Convention that launching States (1) notify the United Nations of the trajectory or timing of de-orbit or (2) identify where the space object will land upon reentry.<sup>60</sup>

Finally, according to Article II of the 1972 Space Liability Convention,<sup>61</sup> a “launching State” is “absolutely liable to pay compensation for damage caused by its space object on the surface of the earth . . . .”<sup>62</sup> Therefore, if a space object launched by China, such as the Long March 5B rocket body, reenters Earth’s atmosphere and causes damage to persons or property on Earth, not only would China be “internationally liable” for such damage under Article VII of the Outer Space Treaty,<sup>63</sup> but China would also be “absolutely liable” under the Liability Convention to “pay compensation for damage caused” by such reentry.<sup>64</sup> The Liability Convention was exercised for the first time in the history of space exploration in

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<sup>56</sup> *Id.* at art. VII (emphasis added).

<sup>57</sup> Convention on Registration of Objects Launched into Outer Space, Jan. 14, 1975, 28 UST. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

<sup>58</sup> *Id.* at art. II.

<sup>59</sup> *Id.* at art. IV.

<sup>60</sup> *See generally*, Registration Convention, *supra* note 57.

<sup>61</sup> Liability Convention, *supra* note 11.

<sup>62</sup> *Id.* at art. II.

<sup>63</sup> Outer Space Treaty, *supra* note 53, art. VII.

<sup>64</sup> Liability Convention, *supra* note 11, art. II.

1978.<sup>65</sup> After Cosmos 954, a Soviet nuclear-powered satellite, crashed in Canada's Northwest Territories and scattered radioactive debris across a large area, the USSR made a payment of approximately \$3,000,000 to the Canadian government.<sup>66</sup> It is not known whether China paid any compensation to the Ivory Coast for damage caused by the May 2020 Long March 5B uncontrolled reentry. It is also not clear that the Liability Convention provides a meaningful deterrent for risky activities in outer space, or if "liability risk" is treated as just another cost of doing business,<sup>67</sup> as in other commercial and diplomatic activities.

Notably, none of the international space law treaties specifically addresses the issue of uncontrolled reentry of space objects like China's Long March 5B rocket body. The shortage of rules on this matter may be due to "[t]he added technological complexity and cost involved in achieving controlled reentries,"<sup>68</sup> as well as the fact that the signatories to the Outer Space Treaty and Liability Convention signed it at the dawn of the space age, when controlled reentry technology did not yet exist. However, in the current environment, States should consider the "cumulative risks"<sup>69</sup> associated with increasing launch cadences, since technologies that could eliminate the need for most uncontrolled reentries have been successfully proven in the 2020s. A careful balance must be struck between promoting public safety from a legal perspective, while keeping the international stage open for new entrants in space launch activities.

### *B. Non-Binding International Guidelines*

Guidance from international organizations and agreements among space agencies, while not binding international law, can be instructive in determining international standards for certain activities. Such guidance can also be interpreted as a means of establishing customary international law and acceptable norms of behavior. According to the Aerospace Corporation's Robin Dickey, "norms

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<sup>65</sup> Bryan Schwartz & Mark L. Berlin, *After the Fall: An Analysis of Canadian Legal Claims for Damage Caused by Cosmos 954*, 27 MCGILL L. J. 677 (1982).

<sup>66</sup> *Id.*

<sup>67</sup> Byers et. al., *supra* note 2, at 1094.

<sup>68</sup> *Id.* at 1093.

<sup>69</sup> *See id.*

of some kind are necessary to protect the safety, stability, security, and sustainability of the space domain.”<sup>70</sup> Specifically, organizations including the Inter-Agency Space Debris Coordination Committee (IADC) and United Nations Office for Outer Space Affairs’ Committee on the Peaceful Uses of Outer Space (UNCOPOUS) have published guidelines for space activities that prescribe preferred approaches for de-orbit and reentry of space objects, including rocket bodies like the Long March 5B first stage.

#### i. IADC Guidelines

On March 1, 2020, the IADC, which is described as “an international forum of space agencies, authorized governmental or inter-governmental entities for the coordination of activities related to the issues of human-made and natural debris in space,”<sup>71</sup> published guidelines for the reduction and treatment of space debris, including post-mission disposal of space objects.<sup>72</sup> Specifically,

[i]f a spacecraft or orbital stage is to be disposed of by reentry into the atmosphere, debris that survives to reach the surface of the Earth should not pose an *undue risk* to people or property. This may be accomplished by limiting the amount of surviving debris or confining the debris to uninhabited regions, such as broad ocean areas.<sup>73</sup>

The China National Space Administration (CNSA) and NASA are both member agencies of the IADC, and the Guidelines “have been agreed to by consensus among the IADC member agencies.”<sup>74</sup> The Guidelines do not define “undue risk” and do not specifically label large rocket bodies as debris that may constitute such a risk.

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<sup>70</sup> Robin Dickey, *Building Normentum: A Framework for Space Norm Development*, AEROSPACE CORP. (Jul. 2021), [https://csps.aerospace.org/sites/default/files/2021-07/Dickey\\_BuildingNormentum\\_20210706.pdf](https://csps.aerospace.org/sites/default/files/2021-07/Dickey_BuildingNormentum_20210706.pdf).

<sup>71</sup> IADC, *IADC Space Debris Mitigation Guidelines* (Mar. 1, 2020), at Foreword <https://orbitaldebris.jsc.nasa.gov/library/iadc-space-debris-guidelines-revision-2.pdf>.

<sup>72</sup> *Id.*

<sup>73</sup> *Id.* § 5.3.2.

<sup>74</sup> *Id.* at Introduction.

## ii. UNCOPOUS Guidelines

In January 2021, the United Nations Office for Outer Space Affairs' Committee on the Peaceful Uses of Outer Space (UNCOPOUS) published Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space<sup>75</sup> (UNCOPOUS Guidelines) These guidelines include a specific Guideline B.9, "Take measures to address risk associated with the uncontrolled reentry of space objects."<sup>76</sup> These measures are excerpted in their entirety in Appendix A.

The UNCOPOUS Guidelines could be a good guidepost for countries, including China, to implement regulations regarding reentry of space objects. Although additional costs and technical challenges are associated with controlled reentry capability, these guidelines indicate that the international community is increasingly recognizing the importance of employing controlled reentry techniques to protect public safety and minimize casualty risk.

### *C. US Space Laws and Regulations Applicable to Rocket Body Reentry*

#### i. US Space Laws

US domestic space law fulfills two primary purposes: originally, to respond to national security concerns relating to the USSR's launch of Sputnik 1,<sup>77</sup> and more generally, to fulfill its obligations under international space law. In fulfillment of its supervisory responsibility obligations under the Outer Space Treaty, the US, through Congress, has passed federal laws to authorize administrative agencies to regulate outer space activities.<sup>78</sup> First, the National Aeronautics and Space Act, passed in 1958, established NASA as a civilian agency to "exercise[e] control over aeronautical

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<sup>75</sup> Comm. on the Peaceful Uses of Outer Space, Rep. of the Comm. on Its Sixty-Second Session, Annex II, U.N. Doc A/74/20 (2019) [https://www.unoosa.org/res/oosadoc/data/documents/2021/stspace/stspace79\\_0\\_html/st\\_space79E.pdf](https://www.unoosa.org/res/oosadoc/data/documents/2021/stspace/stspace79_0_html/st_space79E.pdf) [hereinafter LTS Guidelines].

<sup>76</sup> LTS Guidelines at Guideline B.9.

<sup>77</sup> See STEVE MIRMINA AND CARYN SCHENEWERK, INTERNATIONAL SPACE LAW AND SPACE LAWS OF THE UNITED STATES 7 (2022).

<sup>78</sup> See Outer Space Treaty, *supra* note 53, art. IV; see also MIRMINA & SCHENEWERK, *supra* note 77, at 12.

and space activities sponsored by the United States.”<sup>79</sup> Later codified as positive law of the United States in Title 51 of the United States Code,<sup>80</sup> the NASA Act provides the statutory basis under which US administrative agencies, such as the Federal Aviation Administration (FAA) and the Department of Transportation (DOT), issue regulations in line with Outer Space Treaty obligations. The FAA was granted authority to establish a space vehicle licensing regime under 51 USC. § 50901(b) for the purpose, among others, of “promoting the continuous improvement of the safety of launch vehicles designed to carry humans, including through the issuance of regulations. . .”<sup>81</sup> The NASA ACT also delegates authority to the Secretary of Transportation to “oversee and coordinate the conduct of commercial launch and reentry operations, issue permits and commercial licenses and transfer commercial licenses authorizing those operations, and protect the public health and safety, safety of property, and national security and foreign policy interests of the United States.”<sup>82</sup>

Other laws promoting the development of commercial space in the US include the 1984 Commercial Space Launch Act<sup>83</sup> and the 2015 Commercial Space Launch Competitiveness Act, sometimes referred to as the Spurring Private Aerospace Competitiveness and Entrepreneurship (SPACE) Act of 2015.<sup>84</sup>

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<sup>79</sup> National Aeronautics and Space Act of 1958, 51 USC. § 20102 (1958).

<sup>80</sup> National and Commercial Space Programs, Pub. L. 111-314, § 2, 124 Stat. 3328 (2010).

<sup>81</sup> 51 USC. § 50901(b) (“The purposes of this chapter are— (1) to promote economic growth and entrepreneurial activity through use of the space environment for peaceful purposes; (2) to encourage the United States private sector to provide launch vehicles, reentry vehicles, and associated services by— (A) simplifying and expediting the issuance and transfer of commercial licenses; (B) facilitating and encouraging the use of Government-developed space technology; and (C) *promoting the continuous improvement of the safety of launch vehicles designed to carry humans, including through the issuance of regulations, to the extent permitted by this chapter*”) (emphasis added).

<sup>82</sup> 51 USC. § 50901(b)(3).

<sup>83</sup> Commercial Space Launch Act, Pub. L. No. 98-575, § 7, 98 Stat. 3055, 3058 (1984) (codified as amended at 49 USC. 70101 (Suppl. II 2008)).

<sup>84</sup> Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90 (2015).

## ii. US Regulatory Framework

Safe launch and reentry are a primary goal of US space regulations.<sup>85</sup> Part 450 of the FAA regulations details the licensing process for US commercial space launches, including the “requirements for obtaining and maintaining a license to launch, reenter, or both launch and reenter a launch or reentry vehicle.”<sup>86</sup> An FAA license “authorizes reentry,” which is defined to include both “activities conducted in Earth orbit or outer space to determine reentry readiness and that are critical to *ensuring public health and safety* and the *safety of property* during reentry flight” and “activities necessary to return the reentry vehicle, or vehicle component, to a *safe condition on the ground* after impact or landing.”<sup>87</sup>

Clear emphasis on safety is prevalent throughout Part 450.<sup>88</sup> Specifically, the applicant for a license must demonstrate that “[i]ts launch or reentry would not *jeopardize public health and safety, safety of property, US national security or foreign policy interests, or international obligations of the United States.*”<sup>89</sup> Similar language is echoed throughout Part 450 in various stages of review, including general payload review and determination;<sup>90</sup> classification of payloads;<sup>91</sup> interagency consultation;<sup>92</sup> payload application

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<sup>85</sup> 14 C.F.R. § 450.1.

<sup>86</sup> *Id.* See also recent regulations of the Federal Communications Commission (FCC) (47 C.F.R. 25.114), which require space stations that are deorbiting and “planning disposal through uncontrolled atmospheric reentry” to complete such disposal no later than five years following the end of the relevant mission. Since space stations are outside the scope of this paper, this analysis will focus on the FAA framework applicable to space launches and reentries.

<sup>87</sup> 14 C.F.R. § 450.3(c) (emphasis added).

<sup>88</sup> 14 C.F.R. § 450.43(a).

<sup>89</sup> *Id.* (emphasis added).

<sup>90</sup> 14 C.F.R. § 450.43(a) (“If applicable, the FAA issues a favorable payload determination for a launch or reentry to a license applicant or payload owner or operator if... [i]ts launch or reentry would not jeopardize public health and safety, safety of property, US national security or foreign policy interests, or international obligations of the United States.”).

<sup>91</sup> 14 C.F.R. § 450.43(c) (“However, prior to a launch or reentry, each payload is subject to verification by the FAA that its launch or reentry would not jeopardize public health and safety, safety of property, US national security or foreign policy interests, or international obligations of the United States.”).

<sup>92</sup> 14 C.F.R. § 450.43(e)(3) (“The FAA consults with... [o]ther Federal agencies, including the National Aeronautics and Space Administration, authorized to address issues of public health and safety, safety of property, US national security or foreign policy

requirements;<sup>93</sup> specific contents of payloads;<sup>94</sup> and other unique safety policies, requirements, and practices.<sup>95</sup> The FAA can deny a launch or reentry license based on “safety approval,”<sup>96</sup> and the burden is on the applicant to demonstrate that reentry activities will not “jeopardize[e] public health and safety and safety of property.”<sup>97</sup> Part 450 also sets forth the system safety program requirements for the “lifecycle of a launch or reentry system,”<sup>98</sup> including requirements for hazard control<sup>99</sup> and physical containment of flight-related hazards to a prescribed containment area.<sup>100</sup> License recipients are required to maintain the accuracy of any representations set forth in their application for the entire term of the license<sup>101</sup> and must apply to the FAA for a license modification if any representation in their application “that is *material to public health and safety or the safety of property* is no longer accurate and complete” or there have been changes to the licensee’s launch or reentry procedure.<sup>102</sup>

The FAA also requires that applicants disclose information about reentering payloads.<sup>103</sup> Specific disclosure requirements for

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interests, or international obligations of the United States, associated with the launch or reentry of a proposed payload or payload class.”).

<sup>93</sup> 14 C.F.R. § 450.43(i)(1)(xi) (The applicant must provide the FAA with “[a]ny other information necessary to make a determination based on public health and safety, safety of property, US national security or foreign policy interests, or international obligations of the United States.”).

<sup>94</sup> 14 C.F.R. § 450.45(e)(6) (“The FAA will evaluate the launch or reentry of any radionuclide on a case-by-case basis, and issue an approval if the FAA finds that the launch or reentry is consistent with public health and safety, safety of property, and national security and foreign policy interests of the United States”).

<sup>95</sup> 14 C.F.R. 450.177(b) (“The FAA may identify and impose a unique policy, requirement, or practice as needed to protect the public health and safety”).

<sup>96</sup> 14 C.F.R. § 450.45(d).

<sup>97</sup> 14 C.F.R. § 450.45(a) (“The FAA issues a safety approval to an applicant if it determines that an applicant can conduct launch or reentry without jeopardizing public health and safety and safety of property. A license applicant must satisfy the application requirements in this section and subpart C of this part.”).

<sup>98</sup> 14 C.F.R. § 450.103.

<sup>99</sup> See 14 C.F.R. § 450.107.

<sup>100</sup> See generally, 14 C.F.R. § 450.110; 14 C.F.R. § 450.133.

<sup>101</sup> 14 C.F.R. § 450.211(a)

<sup>102</sup> 14 C.F.R. § 450.211(b)(2)(emphasis added) (“A change is material to public health and safety or the safety of property if it alters or affects—(i) The class of payload; (ii) The type of launch or reentry vehicle; (iii) The type or quantity of hazardous material; (iv) The flight trajectory; (v) The launch site or reentry site or other landing site; or (vi) Any system, policy, procedure, requirement, criteria, or standard that is safety critical.”).

<sup>103</sup> 14 C.F.R. § 450.43(i)(2).



reentering payloads are outlined in 14 CFR 450.43(i)(2) and include the following:

- (i) Payload name or class of payload, and function;
- (ii) Physical characteristics, dimensions, and weight of the payload;
- (iii) Payload owner and payload operator, if different from the person requesting the payload review and determination;
- (iv) Type, amount, and container of hazardous materials and radioactive materials in the payload;
- (v) Explosive potential of payload materials, alone and in combination with other materials found on the payload or reentry vehicle during reentry; and
- (vi) Designated reentry site.<sup>104</sup>

Finally, 14 CFR 450.101(b) sets forth specific acceptable risk guidelines for the reentry or deorbiting of a space vehicle, specifying the acceptable, quantifiable risk that can be associated with any such activity.<sup>105</sup> These reentry risk criteria for collective risk, individual risk, and aircraft risk are excerpted in their entirety in Appendix B. The FAA regulations demonstrate the agency's commitment to protecting public safety by quantifying risk to individuals, property, and even aircraft. By prescribing quantified risk guidance for rocket body reentry in the licensing requirements for space launch operators, the FAA regulations encourage the safe—preferably controlled—reentry of launch vehicle components. Doing so not only fulfills US responsibilities under international space law, but also sets a standard upon which other players in the space industry can measure the acceptable level of risk associated with their space launch activities.

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<sup>104</sup> *Id.*

<sup>105</sup> 14 C.F.R § 450.101(b).

*D. Applicable Chinese Space Laws, Policy and Regulations*<sup>106</sup>

“...[T]hose assuming that analyzing or interacting with China is the same as dealing with any other country are deluding themselves.”<sup>107</sup>

China is unusual among space powers in that it lacks a national space law.<sup>108</sup> In analyzing Chinese laws and regulations applicable to outer space activities, and specifically uncontrolled reentry, it is necessary to first consider the cultural context of the role of law and codification in modern Chinese society. Especially for a Western audience, “it is surely necessary to acquaint ourselves with the particular cultural background we wish to study before we can really understand the foreign text,”<sup>109</sup> and “when studying non-Western legal systems and cultures, [non-Chinese] must not approach or appraise these systems from their own Western viewpoints or judge them by European or American standards.”<sup>110</sup> Western scholarship on Chinese space law, and on the role of law in China more generally, is lacking compared with other jurisdictions.

First, in the Chinese system, “the legal and organizational factors of space activities are subordinated to the overall national strategy development based on the principles of the rule of law with the Chinese specifics.”<sup>111</sup> “Chinese specifics” in the rule of law in China can be difficult for outsiders to understand, but can be described as follows:

The first thing to note is that the theoretical thinking and practice of the Chinese rule of law is based on the theoretical postulates of Marxism, not dogmatic, but taking into account the modern time and the Chinese traditions. When the process of government is carried out in accordance with the law and on

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<sup>106</sup> Where translations of original Chinese text, including applicable regulations and similar, are used in this Section and elsewhere in this Article, unless noted otherwise herein, these translations are unofficial translations by the author of this Article and have not been professionally certified.

<sup>107</sup> JOHNSON-FREESE, *supra* note 13, at 38.

<sup>108</sup> See Olga Yeshchuk & Anna Vasina, *Chinese Space Law: Problems and Areas of Reforming*, 3 ADVANCED SPACE L., 140, 140 (2019) [http://asljournal.org/journals/2019-3/ASL\\_vol\\_3\\_YeshchukVasina.pdf](http://asljournal.org/journals/2019-3/ASL_vol_3_YeshchukVasina.pdf).

<sup>109</sup> PETER DE CRUZ, *COMPARATIVE LAW IN A CHANGING WORLD* 223 (3d ed. 2008) (1995).

<sup>110</sup> *Id.* at 229.

<sup>111</sup> Yeshchuk & Vasina, *supra* note 108, at 141.

the basis of Marxist theory of law and practice of a socialist legal state with Chinese characteristics. After all, according to Chinese scholars, the rule of law in any country not only reflects the universality and community, but also the peculiarity and individual development of each state. Such features include the specific legal culture of Chinese citizens and the understanding that the development of the rule of law cannot go beyond the stages of economic and social development.<sup>112</sup>

The roles that lawyers, judges, statutes and contracts play in society in the Chinese legal system are distinct from their roles in the US and Western legal systems.<sup>113</sup> For example, “law and the recourse to the courts is traditionally seen as a last resort” in the Chinese system, and law is perceived as playing a “minor role” in society.<sup>114</sup> Conversely, “the lack of a mature legal system is often cited by the Chinese to explain their inability to accommodate normal business practices.”<sup>115</sup> For these reasons, it makes some sense that China would proceed to develop leading space capabilities in the absence of the type of legal and regulatory framework that Western scholars would expect to see—though it also reasonably raises questions as to whether China’s existing legal framework is sufficient to govern their increasingly frequent space launch activities.

#### i. Five-Year Plans

Because China lacks formal space laws, its space activities are instead governed by informal departmental regulations and national long-term policies referred to as five-year-plans, or White Papers.<sup>116</sup> China’s most recent five-year plan is discussed in more detail in Part IV.

#### ii. Chinese Departmental Regulations

As discussed above, China is a party to the Outer Space Treaty, Registration Convention, and Liability Convention.

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<sup>112</sup> *Id.* at 141-42.

<sup>113</sup> DE CRUZ, *supra* note 109.

<sup>114</sup> *See id.* at 209.

<sup>115</sup> JOHNSON-FREESE, *supra* note 13, at 27.

<sup>116</sup> *See* Yeshchuk & Vasina, *supra* note 108.

However, these international space treaties are not self-executing and require States to adopt domestic rules and regulations to implement them.<sup>117</sup> In China, “the lack of formal national civil space law. . . does not mean that there is no legal regulation in the field.”<sup>118</sup>

China’s space program is instead governed by low-level administrative regulations: (1) Measures for the Administration of Registration of Objects Launched into Outer Space 2001<sup>119</sup> (Registration Measures) (2) Interim Procedure for the Administration of Licenses for Civil Space Launch Programs<sup>120</sup> (Licensing Measures) and (3) various non-binding, interim space debris mitigation measures.<sup>121</sup> Of these, (2) and (3) are the most immediately applicable to uncontrolled reentry and reentry regulations.

#### *a. Registration Measures*

The Registration Measures have been enacted in the form of departmental regulations, which constitute “one of the lowest level of laws in China.”<sup>122</sup> The purpose of the 2001 Registration Measures is to implement China’s obligations under the Registration Convention, which requires States Parties to register space objects in

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<sup>117</sup> See Fabio Tronchetti, *Space Law and China*, in OXFORD RESEARCH ENCYCLOPEDIA OF PLANETARY SCIENCE (2019), <https://oxfordre.com/planetaryscience/display/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-66?d=%2F10.1093%2Facrefore%2F9780190647926.001.0001%2Facrefore-9780190647926-e-66&p=emailAKJ3P%2FekvgM7>.

<sup>118</sup> Yeshchuk & Vasina, *supra* note 108.

<sup>119</sup> Measures for the Administration of Registration of Objects Launched into Outer Space 2001.

<sup>120</sup> China Comm’n of Sci., Tech., and Indus. for Nat’l Def., Ord. No. 12: Interim Procedure for the Administration of Licenses for Civil Space Launch Programs, (Nov. 21, 2002)

[http://www.moj.gov.cn/pub/sfbgw/flfggz/flfggzbmgz/200303/t20030321\\_143416.html](http://www.moj.gov.cn/pub/sfbgw/flfggz/flfggzbmgz/200303/t20030321_143416.html) [hereinafter Licensing Measures].

<sup>121</sup> See 空间碎片减缓要求 (*Kongjian Yapian Jianhuan Yaoqiu*), 中华人民共和国航天行业标准, 国防科学技术工业委员会法师, (Apr. 11, 2005), *QJ 3221-2005.pdf* ([ydylstandards.org.cn](http://ydylstandards.org.cn)) [hereinafter Space Debris Mitigation Requirements]; see also Zizheng Gong, *China Practices on Satellites Post Mission Disposals Toward Space Long Term Sustainability*, presented at 53rd Sess. of the Comm on the Peaceful Uses of Outer Space Sci. and Tech. Subcomm. (Feb. 15-26, 2016), <https://www.unoosa.org/documents/pdf/copuos/stsc/2016/tech-21E.pdf>.

<sup>122</sup> Tronchetti, *supra* note 117, at 3.

national and international registries.<sup>123</sup> The Registration Measures do not, however, require any registration or reporting of reentering space objects.<sup>124</sup>

*b. Licensing Measures*

The purpose of the 2002 Licensing Measures is to standardize the management of civil (non-military) space launch projects, promote the “healthy development” of China’s civil space launch industry, and fulfill China’s obligations under the Outer Space Treaty.<sup>125</sup> The Licensing Measures require “any natural person, legal person, or organization engaged in civil launch projects” to apply for “examination and approval” from China’s National Defense Science, Technology and Industry Commission (SASTIND), and applicants are prohibited from carrying out such a project until an authorization is obtained.<sup>126</sup>

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<sup>123</sup> *Id.*; *see also*, China Comm’n of Sci., Tech., and Indus. for Nat’l Def. and the Ministry of Foreign Affairs, Ord. No. 6: Procedure of Space Objects Registration and Management (Feb. 8, 2001).

<sup>124</sup> *See id.*

<sup>125</sup> *See* Licensing Measures, *supra* note 120.

<sup>126</sup> *Id.* at art. III.

License applicants must meet the following conditions:

<p>(1) Abide by State laws and regulations, and keep State secrets;</p> <p>(2) The applied project does not endanger national security, does not harm national interests, and does not violate the country's foreign policy and signed and effective international conventions;</p> <p>(3) The project being applied for will not cause irreparable harm to public health, safety and property <i>due to gross negligence or intentional behavior</i>;</p> <p>(4) Possess relevant permit documents issued by relevant State departments to engage in the applied project;</p> <p>(5) Possess the technical force, economic strength and complete technical information to engage in the applied project; and</p> <p>(6) Other conditions stipulated by laws, regulations and rules.<sup>127</sup></p>	<p>(一) 遵守国家法律、法规，保守国家秘密；</p> <p>(二) 申请的项目不危害国家安全，不损害国家利益，不违反国家的外交政策和已签署并发生效力的国际公约；</p> <p>(三) 申请的项目不会因重大过失或故意行为对公众的健康、安全和财产构成无法补偿的危害；</p> <p>(四) 具有国家有关部门发放的从事所申请项目的相关许可文件；</p> <p>(五) 具备从事所申请项目的技术力量、经济实力及完善的技术资料；</p> <p>(六) 法律、法规、规章规定的其它条件。</p>
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Here, the license requirements differ significantly from Part 450 under the US licensing regime. Unlike the commitment to public health and safety that is referenced throughout Part 450, the Licensing Measures only require that the project for which the applicant applies will not cause “irreparable” harm to public health, safety and property “due to gross negligence or intentional

<sup>127</sup> *Id.* at art. V (emphasis added). As noted above in Note 106, this is an unofficial translation by the author of this Article and has not been professionally certified.

behavior.”<sup>128</sup> This language limits the scope of the protection significantly.

The Licensing Measures also require a satellite launcher to provide:

<p>Safety design reports related to the project and materials for ensuring public safety, the reliability of key safety systems, and the impact of normal and fault states during the launch process of the launch vehicle on property and personal safety near the launch site and within the range of the launch track. impact, how to avoid pollution and space debris, and other safety-related supplementary materials; for foreign-related projects, policy assessment and confidential safety assessment materials must also be submitted.<sup>129</sup></p>	<p>(四) 与该项目相关的安全设计报告及保障公众安全的材料, 关键安全系统的可靠性、运载火箭发射过程中正常及故障状态对发射场附近及发射轨迹范围内的财产及人身安全构成的影响、如何避免污染和空间碎片问题以及其它有关安全的补充材料; 涉外项目, 还须提交政策性评估和保密安全性评估材料。</p>
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Notably, the disclosure requirements relating to safety, space debris, and hazard mitigation are limited solely to launch, not reentry. There is some scholarly criticism as to

whether the scope of the license, apart from covering the launch itself, also extends to activities actually occurring in outer space once the launch is complete. In other words, as the [Licensing] Measures only focus on the ‘launching’ phase, it is not clear whether the behavior of the licensee in space is regulated by the [Licensing] Measures and if the government is provided with effective means to control it.<sup>130</sup>

<sup>128</sup> *See id.*

<sup>129</sup> *Id.* at art. VI. As noted in Note 106, this is an unofficial translation by the author of this Article and has not been professionally certified.

<sup>130</sup> Tronchetti, *supra* note 117, at 6.

Therefore, it does not appear that the Licensing Measures apply to reentry of space objects.<sup>131</sup> And further, the Licensing Measures do not contain limitations on acceptable ranges of risk or public safety protections for reentry.

*c. Space Debris Measures*

China has circulated various “interim” measures relating to the regulation or mitigation of space debris, but, as “interim” measures, these efforts lack binding effect. Chinese scholars like Dr. Li Shouping, the Director of the Space Law Institute at Beijing Institute of Technology, have noted the need for China to establish national laws or regulations relating to space debris mitigation to implement the UNCOPUOS Guidelines.<sup>132</sup> Li describes the existing space debris mitigation measures in China as “several documents without legally binding force and with limited political influence.”<sup>133</sup> These documents include the interim space debris mitigation measures promulgated between 2005 and 2010.<sup>134</sup> According to Li, the interim measures are “just a government blue book” that do not actually vest any rights, or impose any obligations, on any institutions or individuals in China.<sup>135</sup> Indeed, under the existing Chinese regime, the current space debris mitigation measures lack national authority or enforcement ability from high-level bodies such as the Chinese State Council or NPC,<sup>136</sup> and do not sufficiently regulate space debris mitigation measures such as reentry regulation.

Nevertheless, it can be worthwhile to review the terms of these interim measures, however nonbinding they may be. For example, in the 2005 interim measures, the Chinese term “离轨 (ligui), or de-orbit, is defined as “a maneuver of a space system to artificially leave the original orbit for reentry into the atmosphere before its end of life.”<sup>137</sup> The 2005 interim measures vest authority to regulate

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<sup>131</sup> *Id.*

<sup>132</sup> See Li Shouping, *The Present Situation and Prospects of Chinese National Mechanism on Space Debris Mitigation*, 26航空宇宙法學會誌 第 239, 249 (Dec. 22, 2011).

<sup>133</sup> *See id.*

<sup>134</sup> *Id.*

<sup>135</sup> *Id.*

<sup>136</sup> *See id.*

<sup>137</sup> See Space Debris Mitigation Requirements, *supra* note 121, at 3.5.



space debris mitigation measures with CNSA.<sup>138</sup> The measures require that space operators take measures to establish and implement space debris management plans and effectively control the generation of space debris in the event of a failure of a space object, and also require launch providers, as part of the mitigation plan, to submit a description of the plan for post-mission disposal of space objects.<sup>139</sup> The measures do not, however, specify any preferred “post-mission disposal” or reentry procedures, or provide acceptable risk or casualty limitations for post-mission or deorbiting activities.<sup>140</sup> Instead, the measures encourage disclosure of the intended approach and available alternative options.<sup>141</sup>

A subsequent interim space debris measure, the 2010 Space Debris Interim Instrument, encourages space operators to comply with a series of technical standards.<sup>142</sup> These standards include: (1) control of debris release during normal operations; (2) minimization of debris generated by accidental explosions; (3) choice of safe flight profile and operational configuration; and (4) post-mission disposal of space objects, either by re-orbiting or de-orbiting.<sup>143</sup> Article 8 makes clear that every operator willing to obtain a license to launch a civil space object must include in its application undefined space debris mitigation measures,<sup>144</sup> but again, the measures are very high-level, non-binding, and do not specify reentry requirements beyond disclosure that de-orbiting, or reentry, will occur.

Based on the existing “interim” measures, there is some indication that China may be considering reducing the harmful impacts of space debris – and perhaps, by extension, of uncontrolled reentry. For example, China has indicated the establishment of a space debris coordination and expert group and the Chinese Academy of Space Technology (CAST) Debris Monitoring Research Center to continue its *orbital* debris mitigation efforts.<sup>145</sup> It is not clear

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<sup>138</sup> *Id.* at 5.2.1.

<sup>139</sup> *Id.* at 5.3.1.

<sup>140</sup> *See id.*

<sup>141</sup> *See id.*

<sup>142</sup> Tronchetti, *supra* note 117.

<sup>143</sup> *Id.*

<sup>144</sup> *Id.*

<sup>145</sup> Kevin Pollpeter, *China's Role in Making Outer Space More Congested, Contested, and Competitive*, CHINA AEROSPACE STUD. INST. (Oct. 2021), [https://www.cna.org/archive/CNA\\_Files/pdf/chinas-role-in-making-outer-space-more.pdf](https://www.cna.org/archive/CNA_Files/pdf/chinas-role-in-making-outer-space-more.pdf).

whether either of these initiatives relate to reentry of space objects or launch vehicle components. Moreover, China's actions to date with respect to space debris mitigation, including the various interim measures, all predate the initial launch of Long March 5B.<sup>146</sup> It is not currently known whether CNSA, in launching the Long March 5B, intentionally adheres to the nonbinding interim measures. And furthermore, China's continued practice of repeatedly reentering the Long March 5B in an uncontrolled fashion further calls into question the effectiveness of the existing regime.

#### IV. POLICY FRAMEWORK

##### A. *Applicable US Space Policy*

Two main priorities in US space policy that are important for this analysis are (1) a commitment to safety in space launch and reentry and (2) remaining a world leader in outer space activities—and using that status to influence international norms in outer space activities.

First, safety is a constant refrain in US space policy that transcends political parties and administrations.<sup>147</sup> While the Biden Administration's 2021 US Space Priorities Framework does not specifically discuss controlled reentry, a commitment to developing space capabilities in a safe manner is apparent:

[t]he United States, working with commercial industry, allies, and partners, will promote the implementation of existing measures and lead in the development of new measures that contribute to the safety, stability, security, and long-term sustainability of space activities. The United States will

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<sup>146</sup> See Byers, *supra* note 2.

<sup>147</sup> See, e.g., *Space Policy Directive-22, Streamlining Regulations on Commercial Use of Space*, TRUMP WHITE HOUSE, NAT'L ARCHIVES, (May 24, 2018), <https://trumpwhitehouse.archives.gov/presidential-actions/space-policy-directive-22-streamlining-regulations-commercial-use-space/> (“[i]t is therefore important that regulations adopted and enforced by the executive branch promote economic growth; minimize uncertainty for taxpayers, investors, and private industry; protect national security, *public-safety*, and foreign policy interests; and encourage American leadership in space commerce”) (emphasis added); See also *United States Space Priorities Framework*, WHITE HOUSE, (Dec. 1, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/12/01/united-states-space-priorities-framework/> [hereinafter *Space Priorities Framework*].

demonstrate how space activities can be conducted in a responsible, peaceful, and sustainable manner.<sup>148</sup>

In addition to US policy statements, the FAA's regulatory framework detailed in Part III.C reflects a strong commitment to safety in space launch and reentry as a priority for the US. The consistent messaging—and commitment to safety—in US space policy together reinforce the idea that safe launch and reentry practices are a priority for the US

A second, and perhaps even more important priority for the US in outer space affairs is using its prominent position as a space leader to influence international norms with respect to space activities. The Biden Administration's 2021 Interim National Security Strategic Guidance provides: “[w]e will lead in promoting shared norms and forge new agreements on emerging technologies, *space*, cyber space, health and biological threats, climate and the environment, and human rights.”<sup>149</sup> In addition, the US military's policy documents have a focus on “promot[ing] responsible norms of behavior” in outer space pursuits.<sup>150</sup> Through its space policies, the US continues to use the lens of policymaking and prominence in outer space affairs to influence international norms and create customary international law. Part of the US norm-setting mission includes the Artemis Accords, an inter-agency framework signed by NASA and other national space agencies.<sup>151</sup> While not relating to launch and reentry specifically, even the Accords include their own commitment to “increase the safety of operations” in outer space activities.<sup>152</sup> The US,

. . . whose concerted government-wide efforts to refocus its attention on space led to the creation of a new National Space Policy, as well as a series of Space Policy Directives, which outline and provide rules of the road for American space activities

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<sup>148</sup> Space Priorities Framework, *supra* note 147.

<sup>149</sup> Interim Nat'l Sec. Strategic Guidance, WHITE HOUSE, (Mar. 2021), <https://www.whitehouse.gov/wp-content/uploads/2021/03/NSC-1v2.pdf>.

<sup>150</sup> United States Space Force, *Space Power: Doctrine for US Space Forces*, (June 2020), [https://www.spaceforce.mil/Portals/1/Space%20Capstone%20Publication\\_10%20Aug%202020.pdf](https://www.spaceforce.mil/Portals/1/Space%20Capstone%20Publication_10%20Aug%202020.pdf).

<sup>151</sup> See The Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids, NASA, <https://www.nasa.gov/wp-content/uploads/2022/11/Artemis-Accords-signed-13Oct2020.pdf>.

<sup>152</sup> *Id.*

in the wake of pressing international challenges. These documents cover our human space exploration program (SPD-1); commercial space regulations (SPD-2); national space traffic management (SPD-3); the creation of the Space Force (SPD-4); cybersecurity in space (SPD-5); and space nuclear power and propulsion (SPD-6). With the addition of the US-led Artemis Accords, these documents taken together are a means to establishing modern customary international law and norms of behavior beyond the Cold War-era provisions of the foundational U.N. space treaties.<sup>153</sup>

Another wrinkle applicable to this analysis is the so-called Wolf Amendment. NASA receives its funding via the National Defense Authorization Act (NDAA), a set of annual laws that determines US defense spending, including NASA funding.<sup>154</sup> Notably, under a provision of the NDAA commonly referred to as the Wolf Amendment, NASA, the Office of Science and Technology (OSTP), and the National Space Council (NSC) are expressly prohibited from using any NDAA funds “to develop, design, plan, promulgate, implement, or execute a bilateral policy, program, order, or contract of any kind to participate, collaborate, or coordinate bilaterally in any with China or any Chinese-owned company unless such activities are specifically authorized by a law enacted after the date of enactment.”<sup>155</sup> This prohibition also applies to “any funds used to effectuate the hosting of official Chinese visitors at facilities belonging to or utilized by NASA.”<sup>156</sup> The Consolidated and Further Continuing Appropriations Act, 2013, provided that the prohibitions in the Wolf Amendment can be avoided if NASA or the Office of Science and Technology Policy certifies to Congress that the activities:

- (1) pose no risk of resulting in the transfer of technology, data, or other information with national security or economic security implications to China or a Chinese-owned company; and

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<sup>153</sup> Goguichvili et. al., *supra* note 52.

<sup>154</sup> Fed’n of Am. Sci., *Defense Primer: Navigating the NDAA*, CONG. RSCH. SERV. (Nov. 23, 2022), <https://sgp.fas.org/crs/natsec/IF10516.pdf>.

<sup>155</sup> Department of Defense and Full-Year Continuing Appropriations Act 2011, Pub. L. No. 112-10, § 1340.

<sup>156</sup> *Id.*

(2) will not involve knowing interactions with officials who have been determined by the United States to have direct involvement with violations of human rights.<sup>157</sup>

Because these notification requirements and exceptions exist, the Wolf Amendment has been described as a “speed bump” to collaboration between the US and Chinese space agencies— “not a ban necessarily... but it does require pre-notifying Congress and vetting partners.”<sup>158</sup> It remains to be seen if there is a path for CNSA to execute the Artemis Accords (with an appropriate notification by NASA to Congress) or for the US and Chinese space agencies to find alternative means of cooperation in space.

Note that CNSA has displayed interest in international cooperation in space, as it has executed its own international agreement with Russia’s Roscosmos to develop “a program for the development of space cooperation” between both national space agencies from 2023-2027.<sup>159</sup>

### B. Chinese Space Policy

In China, exploration and use of outer space is carried out in accordance with five-year plans called White Papers.<sup>160</sup> The White Papers are “a kind of Chinese constitution for the next five years, based on the general principle of the rule of law with Chinese features, on the one hand, with the starting points for national civil space law on the other.”<sup>161</sup> Relevant text of the most recent Chinese space policy five-year plan, White Paper 2021: “China’s Space Program: a 2021 Perspective”<sup>162</sup> is excerpted in the table below:

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<sup>157</sup> Consolidated and Further Continuing Appropriations Act, 2013, Pub. L. No. 113-6 (Mar. 26, 2013) § 535(c), <https://www.congress.gov/113/plaws/publ6/PLAW-113publ6.pdf>.

<sup>158</sup> *10 Years of the Wolf Amendment: Assessing Effects and Outcomes*, Zoom Webinar, SECURE WORLD FOUNDATION, (Dec. 9, 2021), [https://swfound.org/media/207289/10-years-of-the-wolf-amendment\\_-assessing-effects-and-outcomes\\_transcript-1.pdf](https://swfound.org/media/207289/10-years-of-the-wolf-amendment_-assessing-effects-and-outcomes_transcript-1.pdf) (including a conversational keynote with former NASA Administrator Charles Frank Bolden Jr.).

<sup>159</sup> *See Russia, China Sign Program of Space Cooperation Development for 2023-2027*, INTERFAX INT’L INFO GRP, (Dec. 29, 2022), <https://interfax.com/newsroom/top-stories/86585/>.

<sup>160</sup> Yeshchuk & Vasina, *supra* note 108.

<sup>161</sup> *See id.* at 142.

<sup>162</sup> 2021中国的航天, 中华人民共和国, (Dec. 1, 2022), 2021中国的航天\_白皮书\_中国政府网 ([www.gov.cn](http://www.gov.cn)); English translation provided at *China’s Space Program: A 2021*

<p><b>2. Development of Space Technology and Systems</b></p> <ul style="list-style-type: none"> <li>• <i>China's space industry serves its major strategic needs, and targets cutting-edge technology that leads the world...</i></li> <li>• <i>As a result, China's capacity to enter and return from space, and its ability to engage in space exploration, utilization and governance have grown markedly along a sustainable path.</i></li> </ul>	<ul style="list-style-type: none"> <li>• <b>二、发展空间技术与系统</b> 中国航天面向世界科技前沿和国家重大战略需求，以航天重大工程为牵引，加快关键核心技术攻关和应用，大力发展空间技术与系统，<b>全面提升进出、探索、利用和治理空间能力</b>，推动航天可持续发展</li> </ul>
<p><i>In the next five years, China will continue to improve the capacity and performance of its space transport system.</i></p>	<p><b>未来五年，中国将持续提升航天运输系统综合性能，加速实现运载火箭升级换代</b></p>
<p><i>In response to the growing need for regular launches, China will develop new rocket engines, combined cycle propulsion, and upper stage technologies to improve its capacity to enter and return from space and make space entry and exit more efficient.<sup>163</sup></i></p>	<p><b>持续开展重复使用航天运输系统关键技术攻关和演示验证。面向航班化发射需求，发展新型火箭发动机、组合动力、上面级等技术，拓展多样化便利进出空间能力。</b></p>

While adding controlled reentry capability is not mentioned specifically, the White Paper does reference a desire for China to “improve its capacity to... return from space.”<sup>164</sup> This implies that China may be working on technological solutions to make its “return from space” more efficient; however, controlled reentry technologies are not mentioned, nor is there any apparent emphasis on improving the safety of, and lowering the associated risks associated with, launch and reentry.

*Perspective*, THE STATE COUNCIL INFORMATION OFFICE OF THE PEOPLE'S REPUBLIC OF CHINA, CHINA NATIONAL SPACE ADMINISTRATION, (Jan. 28, 2022), <https://www.cnsa.gov.cn/english/n6465645/n6465648/c6813088/content.html>.

<sup>163</sup> “Official” English translation provided at *China's Space Program: A 2021 Perspective*, THE STATE COUNCIL INFORMATION OFFICE OF THE PEOPLE'S REPUBLIC OF CHINA, CHINA NATIONAL SPACE ADMINISTRATION (Jan. 28, 2022), <https://www.cnsa.gov.cn/english/n6465645/n6465648/c6813088/content.html>.

<sup>164</sup> *Id.*

## V. RECOMMENDATIONS

## A. Leverage “Normentum” To Exert Pressure

Public and private actors can promote acceptable norms through their behaviors in launch and reentry. Specifically, four “strategic decision points” are involved in developing norms:

- (1) establishing domestic buy-in through interagency coordination;
- (2) selecting initial international negotiating partners;
- (3) choosing diplomatic mechanisms for generating international commitment; and
- (4) setting a target for which and how many states need to support the proposal for it to be considered a norm . . .<sup>165</sup>

By signing on to—and then codifying—recommendations set forth in the IADC and UNCOPUOUS Guidelines, States can signal their commitment to promoting a safe space environment. States should continue to call out unacceptable behavior on the world stage and develop standards and norms by which international space players are expected to operate.

In addition, the increasingly influential role of commercial space actors like SpaceX and Blue Origin in the global launch marketplace may exert pressure on China and others to limit their reliance on uncontrolled reentry. According to Melissa Durkee,

private activity that is attributed to the state becomes ‘state practice’ for the purpose of treaty interpretation or customary international law formation. Moreover, as a matter of realpolitik, private actors standing in the shoes of the state can force states into a reactive posture, easing the commercially preferred rules into law through the power of inertia and changes to the status quo.<sup>166</sup>

For example, the SpaceX Starship rocket, one of the largest and “most powerful” launch vehicles ever built, is a reusable rocket equipped with controlled reentry technology,<sup>167</sup> setting an example for other launchers globally. As both US commercial space

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<sup>165</sup> Dickey, *supra* note 70, at 1.

<sup>166</sup> Melissa (MJ) Durkee, *Interstitial Space Law*, 97 WASH. U. L. REV. 423, 481 (2019).

<sup>167</sup> See SpaceX, *Starship: Service to Earth Orbit, Moon, Mars and Beyond*, <https://www.spacex.com/vehicles/starship/> (last visited Nov. 14, 2023).

enterprises, and a burgeoning commercial space industry in China, develop innovative technologies and demonstrate the ability to reenter their rockets in a controlled, safe fashion, additional pressure may be exerted on CNSA to conform to “norms” that may develop into customary international law. To promote public safety and protect non-spacefaring countries from space objects reentering the atmosphere in an uncontrolled manner, China should consider amending its existing regulations to include codification of the guidelines recommended by IADC and/or UNCOPUOS, or otherwise require civil and commercial space actors to consider the impacts of reentry of their space vehicles and other space objects. Indeed, Dr. Li Shouping has called on China to introduce binding legislation codifying the UNCOPUOUS Guidelines—as a first step toward the development of a Chinese national space law.<sup>168</sup>

### *B. Improve US-China Communication Channels*

#### *i. Improve Communication Between US and China on Space Safety Issues.*

Currently, the US and China lack a guaranteed line of communications with respect to space issues, including issues of space safety. For example, during the 2007 ASAT test, the 2020 alleged near-collision of the Tiangong space station and Starlink satellites, and the balloon situation in February 2023, both the US and Chinese sides were unable to identify their counterparts in the other country, slowing communication and increasing tension.<sup>169</sup> In order to improve communication between the two space powers, perhaps the US could designate a single US administrative agency as the single point of contact for communications with China on space safety matters. Recent conversations in Washington<sup>170</sup> have indicated that either the FAA or the Department of Commerce may be given the responsibility of overseeing “novel” space activities. China

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<sup>168</sup> Li, *supra* note 132, at 252.

<sup>169</sup> See, e.g., Jeff Foust, *China Proposes Formal Lines Of Communication With US On Space Safety*, SPACENEWS (Feb. 15, 2022), <https://spacenews.com/china-proposes-formal-lines-of-communication-with-u-s-on-space-safety/>.

<sup>170</sup> Theresa Hitchens, *White House Nears Plan to Assign Regulatory Authorities for “New” Space Activities*, BREAKING DEFENSE, (Feb. 23, 2023), <https://breakingdefense.com/2023/02/white-house-nears-plan-to-assign-regulatory-authorities-for-new-space-activities/>.



should also designate a point of contact for space communication—in that event, at least there would be a point of contact on each side to call when space safety issues emerge. This could be step one on the road to preventing catastrophic misunderstandings between two space powers.

ii. Reconsider the Wolf Amendment.

The Wolf Amendment, discussed in more detail in Part IV.A above, has been criticized for being both ineffective at its intended purpose and prohibitive of meaningful communication between the US and China in space.<sup>171</sup> Critics have pointed out that since 2011, the US has not seen the desired changes in China’s human rights policies, technological advancement, and policies toward technological espionage that inspired the Wolf Amendment’s enactment in the first place.<sup>172</sup> Moreover, since the Wolf Amendment’s enactment, China has grown rapidly in its economic position, global influence, and space capabilities. The Long March 5B rocket, and China’s standalone space station that it delivers into orbit, were

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<sup>171</sup> See, e.g., SECURE WORLD FOUNDATION, *supra* note 158 (“If you look at what was Congressman Frank Wolf’s purpose, which was to try to isolate the Chinese into more closely abiding with our norms in human rights, it did not accomplish its purpose at all. If we’re looking at slowing [the Chinese space] program or keeping [China] from developing a space program, it did not do that at all. Whatever its purposes were, [the Wolf Amendment] did not end up doing any of that, because we already had safeguards in place to keep them from getting our technology.... Unfortunately, what it has done is caused us to now be on the outside, looking as China presses forward with their 50-year aerospace program and doing things that some people say they’re moving at an incredible pace.”); Makena Young, *Bad Idea: The Wolf Amendment (Limiting Collaboration with China in Space)*, CTR. FOR STRAT. & INT’L STUD., (Dec. 4, 2019), <https://www.csis.org/analysis/bad-idea-wolf-amendment-limiting-collaboration-china-space> (“...since the first iteration of [the Wolf A]mendment, the U.S. has not seen the desired changes in Chinese human rights policies that the Wolf Amendment was intended to spur”); *Trouble in the Stars: The Importance of US-China Bilateral Cooperation in Space*, HARVARD INT’L REV., (Oct. 27, 2019), <https://hir.harvard.edu/trouble-in-the-stars-the-importance-of-us-china-bilateral-cooperation-in-space/> (“the [Wolf A]mendment proves contrary to its own intents and actually increase[s] the risk of war in space.... when the United States refuses to cooperate with China, it gives the impression that US policymakers do not view space as a multilateral environment.”); Jeff Foust, *Defanging the Wolf Amendment*, THE SPACE REV. (Jun. 3, 2019), <https://www.thespacereview.com/article/3725/1> (quoting Todd Harrison, director of the Aerospace Security Project at CSIS, during an April 25 hearing on China’s space activities by the US-China Economic and Security Review Comm’n: “[t]he Wolf Amendment, I believe, has largely proven ineffective in what it is was trying to do. It’s not slowing China down.”).

<sup>172</sup> See generally *id.*

developed independently of existing international cooperation efforts in the International Space Station. As the Center for Strategic and International Studies (CSIS) argues, there could be strategic and national security benefits for the US to allow limited cooperation with China:

As China grows as a space power, US cooperation in selected civil space projects could be one of the best ways to understand the goals and capabilities of the Chinese space agency. Moreover, it would establish avenues of communication and trust between the two nations that could be mutually beneficial in the future. The Wolf Amendment's statutory exclusion of US – Chinese bilateral cooperation in space has only incentivized China to accelerate its space development programs, creating a serious challenger to US leadership in this vital domain of exploration. History has shown that when the US cooperates with foreign competitors in civil space projects, it enhances NASA's leadership role. The Wolf Amendment has neither discouraged Chinese space ambitions or altered China's behavior on human rights—it has only muddled our relationship with China and created an opening for a challenger to NASA's leadership role in space exploration.<sup>173</sup>

While legislative change is slow in the US and walking back a legal requirement widely seen as a needed restriction on China would not be a politically popular position given the current state of the US-China relationship, there may be other ways to improve US communication with China. Finding ways to do so may be key to encouraging the international development of strong safety norms and controlled reentry practices and would be consistent with the US policy goal of remaining the world leader and norm-setter in space launch activities.

## VI. CONCLUSION

In conclusion, while not prohibited by international space law, the uncontrolled reentry of China's Long March 5B contravenes current international norms and, in its current state, poses a continuing risk to public safety—particularly, and unfairly, impacting non-spacefaring nations. In comparison to the US legal and policy

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<sup>173</sup> Young, *supra* note 171.

landscape, which includes detailed safety protocols, risk limitations, and disclosure requirements for both launch and reentry, China's existing domestic space regulations do not provide sufficient protections to people and property at risk of damage from large, uncontrolled, reentering rocket bodies. To address this gap, the US, commercial space actors, and other countries should continue to establish norms and set precedent by (1) signing on to and codifying international guidelines and agreements promoting safe space launch and reentry practices, and (2) continuing to demonstrate safe, controlled launch and reentry. Reusable rockets or spaceplanes with controlled reentry technology exist, and China has demonstrated these capabilities. A system flavored with "Chinese specifics" can still adhere to international norms and guidelines. If China wants to join the world stage in outer space, its behaviors—and its regulatory regime—need to advance, not hinder, the minimization of collision risk from uncontrolled reentry.

## APPENDIX A

Selected text of Guideline B.9 from the Guidelines for the Long-term Sustainability of Outer Space Activities of the Committee on the Peaceful Uses of Outer Space, United Nations Office for Outer Space Affairs:<sup>174</sup>

1. States and international intergovernmental organizations should have in place procedures for furnishing to other States and/or the Secretary-General of the United Nations, via designated entities, as soon as practicable and with updates if necessary, information on the forecasted uncontrolled reentry of potentially hazardous space objects that are under their jurisdiction and control, and communicating the hazards associated with such events . . .
2. States and international intergovernmental organizations with relevant technical capabilities and resources and/or States and international intergovernmental organizations which exercise jurisdiction over the objects forecast to re-enter the atmosphere *should assist each other (in a proactive manner and/or in responding to a request) to improve the reliability of results when predicting the uncontrolled reentry of potentially hazardous space objects, such as by tracking the objects and generating information on their trajectory.* States and international intergovernmental organizations should cooperate to build capacity in the area of monitoring uncontrolled space object re-entries.
3. When feasible and without prejudice to furnishing preliminary information on possible hazardous events associated with the uncontrolled reentry of space objects, the procedures referred to above should be employed during the final phase of the orbital flight of a space object. The procedures should be used until the termination of the ballistic flight of the space object has been confirmed, as well as in the event of the

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<sup>174</sup> (Emphasis added). Full text available here: Comm. on the Peaceful Uses of Outer Space, Rep. of the Comm. on Its Sixty-Second Session, Annex II, U.N. Doc A/74/20 (2019) [https://www.unoosa.org/res/oosadoc/data/documents/2021/stspace/stspace79\\_0\\_html/st\\_space79E.pdf](https://www.unoosa.org/res/oosadoc/data/documents/2021/stspace/stspace79_0_html/st_space79E.pdf).

identification of the space object or its fragments that reach the surface of the Earth.

4. States and international intergovernmental organizations should furnish in a timely fashion relevant information they may have at their disposal, as practicable, to support addressing risks from uncontrolled re-entries. The contents and attributes of such information should, to the extent practicable, be relevant to raising awareness, where appropriate, of possible contingencies associated with high-risk uncontrolled re-entries. States and international intergovernmental organizations should designate appropriate entities that are authorized to provide, request and receive such information.

5. States and international intergovernmental organizations should consider applying design techniques to minimize the risk associated with fragments of space objects surviving uncontrolled reentry.

6. Without prejudice to Article 5 of the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, the State(s) having jurisdiction over the territory on which a space object or its component parts have been discovered or are presumed to have reached the surface of the Earth, should respond to any request for timely consultations by the State or international intergovernmental organization with jurisdiction and control over the object. In such consultations, the State or international intergovernmental organization exercising jurisdiction and control over the object should advise and, if mutually agreed, assist the potentially affected State(s) in the search for and identification, assessment, analysis, evacuation and return of the object or its fragments. State(s) on whose territory a space object or its component parts have been discovered or are presumed to have reached the surface of the Earth should respond to requests from the State or international intergovernmental organization with jurisdiction and control over the object to follow appropriate procedures for, inter alia, identification, assessment, and analysis of the space object or its component parts, to avoid the harmful effects of any hazardous materials which could have survived the uncontrolled reentry.

## APPENDIX B

Selected text of 14 CFR § 450.101(b):

(b) **Reentry risk criteria.** For any reentry, an operator may initiate the deorbit of a vehicle only if all risks to the public satisfy the criteria in this paragraph (b). The following criteria apply to each reentry, other than a suborbital reentry, from the final health check prior to initiating deorbit through final impact or landing:

(1) **Collective risk.** The collective risk, measured as expected number of casualties ( $E_c$ ), consists of risk posed by impacting inert and explosive debris, toxic release, and far field blast overpressure. Public risk due to any other hazard associated with the proposed deorbit of a reentry vehicle will be determined by the Administrator on a case-by-case basis.

(i) The risk to all members of the public, excluding persons in aircraft and neighboring operations personnel, must not exceed an expected number of  $1 \times 10^{-4}$  casualties.

(ii) The risk to all neighboring operations personnel must not exceed an expected number of  $2 \times 10^{-4}$  casualties.

(2) **Individual risk.** The individual risk, measured as probability of casualty ( $P_c$ ), consists of risk posed by impacting inert and explosive debris, toxic release, and far field blast overpressure. Public risk due to any other hazard associated with the proposed flight of a launch vehicle will be determined on a case-by-case basis.

(i) The risk to any individual member of the public, excluding neighboring operations personnel, must not exceed a probability of casualty of  $1 \times 10^{-6}$  per reentry.

(ii) The risk to any individual neighboring operations personnel must not exceed a probability of casualty of  $1 \times 10^{-5}$  per reentry.

(3) **Aircraft risk.** A reentry operator must establish any aircraft hazard areas necessary to ensure the probability of impact with debris capable of causing a casualty for aircraft does not exceed  $1 \times 10^{-6}$ .

# THE SPACE-DEFENSE RELATIONSHIP IN INTERNATIONAL ORGANIZATIONS: PEACEFUL COOPERATION OR INCREASING COMPETITIVENESS?

*Giulia Pascuzzi\**

## ABSTRACT

With the risks associated with the militarization of space becoming increasingly evident, the United Nations has emerged as a key forum for fostering international cooperation and establishing the foundations of space law. However, this research notes a significant trait of space law: the absence of clearly defined terminology, which, accompanied by a global interest shift, increases the risks associated with the space domain. The need for stronger international efforts becomes apparent, while space and defense are increasingly intertwined. International organizations have played a crucial role in shaping space law, yet they have faced challenges in reaching consensus on critical issues. Indeed, despite recognizing the urgency of addressing space weaponization, the international community has yet to find viable solutions. Efforts have been hampered by seemingly contradictory behaviors, heightening mistrust among actors in the increasingly congested and competitive space domain. The establishment of dedicated space forces by advanced spacefaring countries, the North Atlantic Treaty Organization's fifth operational domain and the European Union's search for synergies between civil and military space applications all demonstrate a shifting attitude towards greater involvement of the military sector in outer space.

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## I. INTRODUCTION

The “space race” has always been associated with the need for competing powers to enhance their military capabilities.<sup>1</sup> The Soviet launch of Sputnik in 1957 commenced a technological competition which has brought about an increasing link between space and defense.<sup>2</sup> Today, outer space is recognized as a fundamental part of many countries’ national security.<sup>3</sup>

Because of the risks associated with the militarization of space, the Western and the Soviet Blocs understood that the only forum able to foster international cooperation on the field was the United Nations<sup>4</sup> (UN). To prevent an escalation of the Cold War in outer space, the legislative effort of all the parties involved was of the utmost importance. Therefore, over the years, the General Assembly of the UN (UNGA) became central in the regulation of outer space, setting the foundations for the creation of a new branch of international law: space law.<sup>5</sup>

One noticeable trait of space law is the absence of definitions for terms such as *peaceful*, *outer space*, *space object*, *astronauts* and *weapons of mass destruction*. This absence can be justified by the long negotiating efforts required to elaborate complex notions at a multilateral level. Due to the general environment of distrust and the strategic importance of the domain, States preferred to avoid binding definitions and instead relied on mutual understanding on the importance of keeping outer space a threat-free environment.

This attitude, acceptable in a past when only a handful of countries had launching capabilities, is now proving challenging. Today, the emergence of new interests, both public and private, and the growing threats related to the weaponization of outer space, call for stronger international efforts.

To date, there is no unitary body of law regulating the military uses of outer space. The main sources of regulations are the UN Charter, the Treaty on Principles Governing the Activities of States

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<sup>1</sup> Jayant Prasad, *Forward*, in FIFTY YEARS OF THE OUTER SPACE TREATY: TRACING THE JOURNEY vii, vii (Ajey Lele ed., 2017).

<sup>2</sup> *Id.* at viii.

<sup>3</sup> *Id.*

<sup>4</sup> Ram S. Jakhu, *Evolution of the Outer Space Treaty*, in FIFTY YEARS OF THE OUTER SPACE TREATY: TRACING THE JOURNEY 13, 14 (Ajey Lele ed., 2017).

<sup>5</sup> Peter Jankowitsch, *The Background and History of Space Law*, in HANDBOOK OF SPACE LAW 1, 4 (Frans G. von der Dunk & Fabio Tronchetti eds., 2015).



in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies<sup>6</sup> (Outer Space Treaty), the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies<sup>7</sup> (Moon Agreement), the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water<sup>8</sup> (Partial Test Ban Treaty), *erga omnes* and *ius cogens* norms of international law and, finally, national law. Moreover, an attentive reading of the treaties regulating the use of outer space and celestial bodies suggests the absence of a total ban on the weaponization of the domain, except in cases of nuclear weapons and weapons of mass destruction.<sup>9</sup> While it may be argued that a detailed regulation of States' military activities in space could provide legal certainty and security on the matter, spacefaring nations are unenthusiastic about the idea of entering international obligations which can impact their interests and defense policies.<sup>10</sup> However, States' practice demonstrates that the military use of outer space, so far, has been concentrated on the support of military activities on Earth<sup>11</sup> and that the international community has refrained from displaying weapons in outer space for offensive purposes.<sup>12</sup> Arguably, this attitude demonstrates a more ethical approach to space activities, if compared to other earthly domains. Nevertheless, one should not naively ignore that this philosophy has started to be questioned and endangered. Undoubtedly, humankind's growing reliance on space technology for civilian and military purposes poses concerns about the future protection of satellites and their possible weaponization.<sup>13</sup> Although proposals on arms control have been brought forward—such as the Treaty on Prevention of the Placement of

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<sup>6</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

<sup>7</sup> Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 5, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement].

<sup>8</sup> Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, 480 U.N.T.S. 43, 10 Oct. 1963 [hereinafter Partial Test Ban Treaty].

<sup>9</sup> Outer Space Treaty, *supra* note 6, art. IV. See Fabio Tronchetti, *Legal Aspects of the Military Uses of Outer Space*, in HANDBOOK OF SPACE LAW 331, 338 (Frans G. von der Dunk & Fabio Tronchetti eds. 2015).

<sup>10</sup> Jankowitsch, *supra* note 5, at 14.

<sup>11</sup> Tronchetti, *supra* note 9, at 333.

<sup>12</sup> *Id.*, at 334.

<sup>13</sup> *Id.* at 344-345.

Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects, advanced by China and Russia,<sup>14</sup> or the Code of Conduct for Outer Space Activities suggested by the European Union<sup>15</sup>—a solution is yet to be found.<sup>16</sup> Despite the unwillingness of some actors of the international community to regulate it,<sup>17</sup> the Prevention of an Armed Race in Outer Space (PAROS) is becoming a matter of extreme urgency.

The space-defense dichotomy is acquiring increasing importance due to the threats posed by space debris—arising from asteroids and from obsolete space objects—and State attacks, such as jamming. Another crucial issue associated with the growing importance of space-related human activities is the congestion of outer space. In principle, access to space should be guaranteed to every space actor, present and future, recognizing space as a global public good, i.e., non-rival in consumption and non-excludible. Nevertheless, the reality highlights a worrying trend: spacefaring States launch more than ever, with some actors planning to send megaconstellations of satellites into orbit.<sup>18</sup> Moreover, private entities are now taking active part in space exploration,<sup>19</sup> threatening a dramatic increase in the production of debris. Hence, because of the finite area to where satellites can be launched, outer space represents a common good rather than a public one. This means that its overexploitation will inevitably prevent others from its use, leading to a phenomenon called “the tragedy of the commons,”<sup>20</sup> which will

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<sup>14</sup> Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects, draft available at: <https://digitallibrary.un.org/record/633470?ln=en&v=pdf> [hereinafter 2008 PPWT]. See Tronchetti, *supra* note 9, at 378.

<sup>15</sup> Draft International Code of Conduct for Outer Space Activities available at: [https://www.eeas.europa.eu/sites/default/files/space\\_code\\_conduct\\_draft\\_vers\\_31-march-2014\\_en.pdf](https://www.eeas.europa.eu/sites/default/files/space_code_conduct_draft_vers_31-march-2014_en.pdf). See Tronchetti, *supra* note 9, at 379.

<sup>16</sup> Jinyuan Su & Zhu Lixin, *The European Union Draft Code of Conduct for Outer Space Activities: An Appraisal*, 30 SPACE POLY 34, 39 (2014).

<sup>17</sup> Tronchetti, *supra* note 9, at 381.

<sup>18</sup> Andrew Jones, *The Coming Chinese Megaconstellation Revolution*, SPACENEWS (Feb. 23, 2023), <https://spacenews.com/the-coming-chinese-megaconstellation-revolution/>.

<sup>19</sup> Brian Kennedy & Alec Tyson, *Americans' Views of Space: U.S. Role, NASA Priorities and Impact of Private Companies*, PEW RSCH. CTR. (July 20, 2023), <https://www.pewresearch.org/science/2023/07/20/americans-views-of-space-u-s-role-nasa-priorities-and-impact-of-private-companies/>.

<sup>20</sup> Eligar Sadeh, *Evolution of Policy and Law for International Space Governance, in FIFTY YEARS OF THE OUTER SPACE TREATY: TRACING THE JOURNEY* 13, 14 (Ajey Lele ed.,

not only be in clear contrast with the principles of free exploration and use, but will also represent an enormous risk for those objects already in space. Indeed, in the event of a collision between space objects, a chain reaction could occur, with the probability for catastrophic collisions growing progressively with the amount of debris.<sup>21</sup>

International Organizations (IOs) play a central part in the evolution of space law and best practices. Since the beginning of the space age, spacefaring countries have used international and regional organizations as fora to discuss and tackle space issues. Their crucial role notwithstanding, IOs can effectively function only when Member States are willing to negotiate feasible solutions to common issues. If in the past the threat of a nuclear escalation drove spacefaring nations to adopt binding norms, today this willingness seems inadequate as the most pressing topics in outer space, such as space weaponization and the emergence of unregulated private entities, remain unresolved.

In this regard, this article studies the space-defense relationship in International Organizations, focusing on the role of the United Nations in shaping the current legal framework regulating space activities as well as the current lack of consensus surrounding specific issues, such as the weaponization of space. In a similar fashion, this article will investigate the European Union (EU) approach to the space-defense dichotomy analyzing the European legal framework and the European Space Strategy. In order to better understand the EU approach, the article will briefly analyze the views of some European Member States regarding the increasing interdependence of outer space and defense.

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2017). The “tragedy of the commons” refers to the damages caused by the unregulated exploitation of a common good; self-interested behaviors will cause excessive uses by some, to the detriment of society. In space, it can be associated with the proliferation of space objects and debris, because it could prevent others from reaching the orbits.

<sup>21</sup> *About Space Debris*, EUR. SPACE AGENCY, [https://www.esa.int/Space\\_Safety/Space\\_Debris/About\\_space\\_debris](https://www.esa.int/Space_Safety/Space_Debris/About_space_debris) (last visited Oct. 24, 2023).

## II. THE SPACE-DEFENSE DICHOTOMY WITHIN THE UNITED NATIONS

### A. Peaceful Purposes

By fostering amicable relations among its members and developing internationally recognized principles, the United Nations has played a leading role in the adoption of norms regulating States' behaviors in outer space. In 1952, the UN Legal Department was already stressing the importance of keeping outer space "common property of all [hu]mankind," with the basis of the new legal order being freedom of use and non-exclusion, paramount to keep outer space safe.<sup>22</sup>

This relatively new branch of international law—although a product of a period of enormous global changes, conflict and competition<sup>23</sup>—differs from other fields of international law in building a different ethic.<sup>24</sup> Outer space, unlike other domains on Earth,<sup>25</sup> is not subject to national appropriation<sup>26</sup> and its exploration and use is to be carried out in the interest of all humankind<sup>27</sup>. The overarching goal of preserving peace in orbit was recognized as early as 1958 in the United Nations General Assembly Resolution 1348 Question of the Peaceful Use of Outer Space, which, to that end, established the UN Committee on Peaceful Uses of Outer Space (COPUOS).<sup>28</sup> General Assembly Resolutions are not binding instruments. However, the adoption of Resolution 1348 by consensus and without a formal voting procedure demonstrated the existence of an *opinio iuris*—or better, an *opinio iuris sive necessitatis*—on the peaceful uses of outer space soon after the launch of the first human-made object into orbit, in 1957. States' *opinio iuris* has been restated and reinforced in subsequent Resolutions and Treaties, in particular the Outer Space Treaty, considered by many scholars the *Magna Carta* of space law.<sup>29</sup>

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<sup>22</sup> Jakhu, *supra* note 4, at 14.

<sup>23</sup> *Id.* at 15.

<sup>24</sup> Jankowitsch, *supra* note 5, at 5.

<sup>25</sup> *Id.*

<sup>26</sup> Outer Space Treaty, *supra*, note 6, art. II.

<sup>27</sup> *Id.* at art. I.

<sup>28</sup> G.A. Res. 1348 (XIII) (Dec. 13, 1958).

<sup>29</sup> Jakhu, *supra* note 4, at 13.

States' willingness to cooperate was extremely valuable when an escalation of the Cold War was a tangible risk, so much so that the pillars of space law are still in place today and are widely recognized by the international community. Nevertheless, it is arduous to establish whether the core legal principles on which space law is founded constitute international custom: despite a strong *opinio iuris* on some matters, it is difficult to find enough elements as to identify State practice.

Resolution 1348 recognized the interest of humankind in space exploration and the importance of using the domain for peaceful purposes. From there on, the principle that outer space activities should be carried out for peaceful purposes has been echoed in every UN Resolution dealing with outer space.<sup>30</sup>

Even if it became a pivotal principle, no real definition of the term *peaceful* has ever been adopted, creating debates over its interpretation.

Discussions have been centered on whether the term *peaceful* means "non-aggressive" or "non-military." The former interpretation, promoted by the United States,<sup>31</sup> suggests that every military activity in conformity with the prohibition of the use of force, contained in the Charter of the United Nations, would be legal under international law. The latter approach, supported by the Soviet Union,<sup>32</sup> argues that the prohibition of the use of force encompasses every possible military activity in outer space.<sup>33</sup>

Under international law, "a treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose."<sup>34</sup> Considering the general obligation upon States to refrain from the use of force, "peaceful" has been interpreted as "non-aggressive," widely accepting the concept that military uses of space technology conform with international law.

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<sup>30</sup> See, e.g., G.A. Res. 1721 (XVI) (Dec. 20, 1961); G.A. Res. 55/122 (Dec. 8, 2000); G.A. Res. 69/85 (Dec. 5, 2014); G.A. Res. 76/76 (Dec. 9, 2021) G.A. Res. 77/121 (Dec. 12, 2022).

<sup>31</sup> Tronchetti, *supra* note 9, at 339-340.

<sup>32</sup> *Id.* at 339.

<sup>33</sup> *Id.*

<sup>34</sup> Vienna Convention on the Law of Treaties art. 31, May 23, 1969, 1155 U.N.T.S. 331.

Consequently, it can be argued that peaceful military uses of outer space are compatible with the prohibition of the use of force, which could only be derogated from in case of self-defense or a United Nations Security Council Resolution under Chapter VII of the UN Charter.<sup>35</sup> As a direct consequence, as space technology developed, so did its uses in the military field.

On the one hand, a strong *opinio iuris* regarding the peaceful uses of outer space exists; on the other, identifying a shared State practice is a complex task. Arguably, spacefaring States have so far refrained from aggressive behaviors in orbit. However, some actions are not fully classified as peaceful. For instance, considering anti-satellite (ASAT) testing and deployment, as well as rendezvous and espionage missions, States' increasing trend is to resort to dangerous actions in space.

Resolution 1348 also observed the importance of international cooperation in the field. Therefore, the Assembly established COPUOS, a body initially comprising eighteen members from the Global North and the Global South.<sup>36</sup> COPUOS was tasked with reporting to UNGA on the status of international cooperation and programs devoted to the enhancement of the peaceful uses of outer space, the status of future arrangements on space cooperation and the legal issues that could arise in the exploration of the domain.<sup>37</sup>

The Committee's work enabled the development of the five international treaties on space: the Outer Space Treaty,<sup>38</sup> the Rescue and Return Agreement,<sup>39</sup> the Liability Convention,<sup>40</sup> the Registration Convention<sup>41</sup> and the Moon Agreement.<sup>42</sup>

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<sup>35</sup> U.N. Charter arts. 39-51.

<sup>36</sup> As of 2023, 102 countries are party to UNCOPUOS. See *Committee on the Peaceful Uses of Outer Space: Membership Evolution*, UNITED NATIONS OFF. FOR OUTER SPACE AFFS., <https://www.unoosa.org/oosa/en/ourwork/copuos/members/evolution.html> (last accessed Oct. 24, 2023).

<sup>37</sup> G.A. Res. 1348 (XIII) (Dec. 13, 1958).

<sup>38</sup> Outer Space Treaty, *supra* note 6.

<sup>39</sup> Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Apr. 22, 1968, 19 U.S.T. 7570, 672 U.N.T.S. 119 [hereinafter Return and Rescue Agreement].

<sup>40</sup> Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention].

<sup>41</sup> Convention on Registration of Objects Launched into Outer Space, Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

<sup>42</sup> Moon Agreement, *supra* note 7.

### B. Delimitation of Outer Space

As the only spacefaring countries at the time of the negotiation of the Outer Space Treaty, the US and Soviet Union led the diplomatic consultations. Nonetheless, the active contribution of every member of COPUOS was essential in developing the provisions contained in the *Magna Carta* of space law. For instance, the role of the Global South was decisive in including core provisions, such as “irrespective of their degree of economic or scientific development”<sup>43</sup>, within the operative part of the treaty, as supported by the Brazilian delegation.<sup>44</sup> The wide contribution of COPUOS members reflects the importance of the domain and the strong duties of cooperation that outer space exploration entails. Similarly, the need for a consensus in adopting decisions highlights the different ethic on which space law rests: the welfare of *all humankind* outweighs States’ interests, displaying the intention to “detoxify international relations of the phantom of sovereignty.”<sup>45</sup> However, reality does not always resemble Treaty principles and Preambles, and the need to find agreements can result in principles of law which may be too general, factually sacrificing certainty and predictability.

Arguably, the lack of an explicit definition and delimitation of *outer space* demonstrates this. Although the establishment of a defined demarcation of the domain has been on the agenda of the Legal Subcommittee of COPUOS since 1966, difficulties arose in identifying scientific or technical criteria precise enough to anticipate implications in future exploration and research.<sup>46</sup> Moreover, not every delegation perceived the issue as pressing, and those that did could not always agree on the approach to use when defining the domain.<sup>47</sup>

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<sup>43</sup> Outer Space Treaty, *supra* note 6, art. I.

<sup>44</sup> Jakhu, *supra* note 4, at 17.

<sup>45</sup> G.S. Sachdeva, *Outer Space Treaty: An Appraisal*, in FIFTY YEARS OF THE OUTER SPACE TREATY: TRACING THE JOURNEY 24, 44 (Ajey Lele ed., 2017).

<sup>46</sup> Historical Summary on the Consideration of the Question on the Definition and Delimitation of Outer Space, Rep. of the Secretariat, U.N. Doc. A/AC.105/769, [https://www.unoosa.org/pdf/reports/ac105/AC105\\_769E.pdf](https://www.unoosa.org/pdf/reports/ac105/AC105_769E.pdf).

<sup>47</sup> *Id.*

Some delegations advanced a “spatialist” approach<sup>48</sup> supporting an altitude-based system.<sup>49</sup> Others supported a “functionalist” approach calling for a definition of outer space activities, so as to distinguish them from airspace ones.<sup>50</sup> In 1983, the Soviet Union proposed a boundary at an altitude not exceeding 110 km, under which States retained the right of peaceful flight over other States’ territory for returning to Earth or entering orbit. Still, no consensus was found and thus no agreement reached.<sup>51</sup> The main reason is that some countries—such the United States—contend that the absence of a demarcation is a negligible matter that has not caused substantial legal issues in either space or air law.<sup>52</sup>

On the other hand, the delegations petitioning for a demarcation of the domain—championed by Russia and China—believe it would avoid uncertainty as to which legal regime applies.<sup>53</sup> That is because, while air law is rooted in sovereignty, as every State enjoys “complete and exclusive sovereignty over the airspace above its territory,”<sup>54</sup> “Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by means of sovereignty....”<sup>55</sup> Similarly, if under air law, liability rests upon the air carrier,<sup>56</sup> under space law the State “is internationally liable for damage”<sup>57</sup> and “shall be absolutely liable to pay compensation for

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<sup>48</sup> Frans G. von der Dunk, *The Delimitation of Outer Space Revisited: The Role of National Space Laws in the Delimitation Issue*, in PROCEEDINGS ON THE FORTY-FIRST COLLOQUIUM ON THE LAW OF OUTER SPACE 254, 256 (1998).

<sup>49</sup> U.N., Space Safety L. & Regul. Comm. of the Int’l Ass’n for the Advancement of Space Safety, Comm. on the Peaceful Uses of Outer Space, Suborbital Flights and the Delimitation of Air Space vis-à-vis Outer Space: Functionalism, Spatialism and State Sovereignty, at 10-11, U.N. Doc. A/AC.105/C.2/2018/CRP.9 (2018).

<sup>50</sup> Jonathan C. McDowell, *The Edge of Space: Revisiting the Karman Line*, 151 ACTA ASTRONAUTICA 668, 668 (2018).

<sup>51</sup> *Id.*

<sup>52</sup> *Delimitation of Outer Space, Executive Brief No.11*, EUR. SPACE POL’Y INST. (March 1, 2017), <https://www.espi.or.at/briefs/delimitation-of-outer-space/> (last visited July 30, 2023).

<sup>53</sup> *Id.*

<sup>54</sup> Chicago Convention on International Civil Aviation, art. 1, 15 U.N.T.S. 295 (Dec. 7, 1944).

<sup>55</sup> Outer Space Treaty, *supra* note 6, art. II.

<sup>56</sup> See The Warsaw Convention for the Unification of Certain Rules Relating to International Carriage by Air, 49 Stat. 3000, (Oct. 12, 1929).

<sup>57</sup> Outer Space Treaty, *supra* note 6, art. VII.



damage caused by its space object on the surface of the Earth or to aircraft in flight.”<sup>58</sup>

Disagreements over the delimitation of outer space also exist outside COPUOS. The Fédération Aéronautique Internationale (FAI) adopted the Kármán line, 100 km, as the “edge of space,” the boundary between aeronautics and astronautics.<sup>59</sup> However, the US Air Force and National Aeronautics and Space Administration (NASA), among others, place such a boundary at about 80 km.<sup>60</sup> In 2019, FAI announced that recent data had compelled the organization to reduce the “edge of space” from 100 km to 80 km.<sup>61</sup>

The strategic importance of outer space renders the development of an international definition extremely difficult. If the boundary is set too high above sea level, some space objects may be considered aircrafts,<sup>62</sup> even if the latter operate at a considerably lower altitude. Consequently, what we now consider space objects may be regulated by a different regime and their operations and passages would be subjected to States’ approval.<sup>63</sup> On the other hand, a demarcation line situated at a lower altitude risks interfering with countries’ defensive capabilities<sup>64</sup>.

Considering the existence of operational boundaries among aerospace activities, another approach could be the “functionalist” one, but this too presents issues as the reality of activities is arduous to assess, also considering the absence of a definition of “space object.”<sup>65</sup>

The lack of a consensus regarding the issue on the one hand, and its possible solution on the other, renders the question

<sup>58</sup> Liability Convention, *supra* note 40, art. II.

<sup>59</sup> *100 km Altitude Boundary for Astronauts*, FÉDÉRATION AÉRONAUTIQUE INTERNATIONALE ASTRONAUTIC RECS. COMM’N, <https://www.fai.org/page/icare-boundary> (last visited Oct. 27, 2023).

<sup>60</sup> Nadia Drake, *Where, Exactly, Is the Edge of Space? It Depends on Who You Ask*, NAT’L GEO. SCI. (Dec. 20, 2020), <https://www.nationalgeographic.com/science/article/where-is-the-edge-of-space-and-what-is-the-karman-line>.

<sup>61</sup> *Statement About the Karman Line*, FÉDÉRATION AÉRONAUTIQUE INTERNATIONALE (Nov. 30, 2018), <https://www.fai.org/news/statement-about-karman-line> (last accessed July 30, 2023).

<sup>62</sup> McDowell, *supra* note 50, at 668-669.

<sup>63</sup> *Id.*

<sup>64</sup> Executive Brief No.11, *supra* note 52.

<sup>65</sup> Andrea J. DiPaolo, *Definitions and Delimitations of Outer Space: The Present Need to Determine Where “Space Activities” Begin*, 39 ANNALS AIR & SPACE L. 623, 624 (2014).

extraordinarily complicated. However, it is safe to assume that the emergence of private interests will have an impact in the debate.

*a. A Change in Tone*

As mentioned before, “peaceful” has been associated with non-aggressive.<sup>66</sup> Thus, to avoid turning outer space into a nuclear warzone, States negotiated the arms control clause enshrined in Article IV of the Outer Space Treaty,<sup>67</sup> which prohibits the placement in orbit of “any object carrying nuclear weapons or any other kind of weapon of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.”<sup>68</sup> Moreover, the Article forbids the “establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers on celestial bodies.”<sup>69</sup>

Despite the farsighted character of the Treaty provision, the Outer Space Treaty remains too general as to the issue of an arms race in outer space. Indeed, the prohibition concerns the placement of *any type of weapons only on celestial bodies*, leaving the possibility to weaponize orbits, except for nuclear weapons and weapons of mass destruction,<sup>70</sup> but without providing a definition of the latter. Undeniably, at the time of the negotiation of the Treaty, the issue of weaponization of space involved the actions of two countries which could discuss the topic through bilateral instruments, avoiding the lengthy process of consensus-building. The adoption of the *Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems* (ABM Treaty) in 1972 exemplifies this Cold War trend. The Treaty in question regulated the development and deployment of Anti-Ballistic Missile (ABM) technology, establishing, *inter alia*, a general obligation between the parties “not to develop, test, or

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<sup>66</sup> Tronchetti, *supra* note 9, at 338-339.

<sup>67</sup> *Id.* at 340-341.

<sup>68</sup> Outer Space Treaty, *supra* note 6, art. IV.

<sup>69</sup> *Id.*

<sup>70</sup> The testing of nuclear weapons in outer space had already been prohibited by the Partial Test Ban Treaty. See Partial Test Ban Treaty, *supra* note 8.

deploy ABM systems or components,”<sup>71</sup> factually integrating the general obligations contained in Article IV of the Outer Space Treaty.<sup>72</sup> Following US withdrawal in 2002,<sup>73</sup> the Treaty is no longer in force, leaving the Anti-Ballistic Satellite systems factually unregulated.

The 1979 Moon Agreement marked the last international effort to find consensus on binding norms regulating outer space and represented another attempt to integrate the general arms control provisions contained in the OST. Article III bans “the threat or use of force or any other hostile act or threat of hostile act on the Moon . . .”<sup>74</sup> and the use of the Moon to target Earth, spacecrafts, and personnel.<sup>75</sup> Yet the Moon Agreement was ratified only by eighteen countries and signed by four,<sup>76</sup> suggesting a progressive disengagement of the international community towards legally binding norms.

The beginning of the 21st century unfolded a drastic change of international politics<sup>77</sup> and like a chain reaction, a general environment of growing mistrust characterized the space domain.<sup>78</sup>

In the past twenty years, countries resumed ASAT-weapons testing: in 2007, China successfully deployed its ASAT technology against one of its satellites;<sup>79</sup> in 2008, the US terminated one of its

<sup>71</sup> Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems, U.S.-U.S.S.R. art. V, May 26, 1972, 23 U.S.T. 3435.

<sup>72</sup> Jakhu, *supra* note 4, at 193.

<sup>73</sup> Diplomatic Notes to Russia, Belarus, Kazakhstan, and Ukraine, December 13, 2001, available at: <https://www.armscontrol.org/act/2002-01/us-withdrawal-abm-treaty-president-bushs-remarks-and-us-diplomatic-notes#notes>. See Aleksandr Klapovskiy & Vladimir Yermakov, *Russia and the Outer Space Treaty*, in *FIFTY YEARS OF THE OUTER SPACE TREATY: TRACING THE JOURNEY* 103, 105 (Ajey Lele ed., 2017).

<sup>74</sup> Moon Agreement, *supra* note 7, art. III.

<sup>75</sup> *Id.*

<sup>76</sup> France is the only United Nations Security Council Member to have signed the agreement. See United Nations Office for Outer Space Affairs, Status of International Agreements Relating to Activities in Outer Space as at 1 January 2022, U.N. Doc. A/AC.105/C.2/2022/CRP.10 (Mar. 28, 2022).

<sup>77</sup> Ranjana Kaul, *Relevance and Limitations of Outer Space Treaty in 21st Century*, in *FIFTY YEARS OF THE OUTER SPACE TREATY: TRACING THE JOURNEY* 48, 53 (Ajey Lele ed., 2017).

<sup>78</sup> Jayant Prasad, *Conclusion*, *FIFTY YEARS OF THE OUTER SPACE TREATY: TRACING THE JOURNEY* 195, 199 (Ajey Lele ed., 2017).

<sup>79</sup> Kaul, *supra* note 77, at 53.

own malfunctioning space objects;<sup>80</sup> in 2019, India launched and then destroyed one of its own satellites,<sup>81</sup> and in 2021, Russia used its ASAT capabilities to target and destroy one of its assets in orbit.<sup>82</sup>

At the same time, the negotiation of binding mechanisms was replaced by agreements on soft law instruments, mainly UN General Assembly resolutions such as: *Guidelines Related to Space Debris Mitigation* in 2007,<sup>83</sup> *No First Placement of Nuclear Weapons, Weapons of Mass Destruction (WMD) in Outer Space* in 2014<sup>84</sup> and *International Cooperation on Peaceful Uses of Outer Space* in 2015.<sup>85</sup> In 2021, the UN General Assembly adopted a resolution that established a working group whose purpose is to consider present and future space threats and recommend regulations for activities in outer space and the prevention of an armed race.<sup>86</sup> In addition, the First Committee approved the draft resolution *Destructive Direct-Ascent Anti-Satellite Missile Testing*<sup>87</sup> proposed jointly by the United Kingdom and the US in 2022, which calls on Member States to refrain from conducting orbital debris-generating ASAT tests.

Although UN General Assembly Resolutions can be evidence of *opinio iuris* or *opinio iuris sive necessitatis*, they do not contain legal obligations and have no attached compliance mechanism. Despite recalling the principles on which outer space activities must be conducted, the UN General Assembly has not played a direct role in the development of policies aimed at addressing the space-defense relationship.

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<sup>80</sup> *Id.* at 54.

<sup>81</sup> Ashley J. Tellis, *India's ASAT Test: An Incomplete Success*, CARNEGIE ENDOWMENT FOR INT'L PEACE (Apr. 15, 2019), <https://carnegieendowment.org/2019/04/15/india-s-asat-test-incomplete-success-pub-78884>.

<sup>82</sup> Tariq Malik, *International Space Station Dodges Orbital Debris from Russian Anti-Satellite Test*, SPACE (June 19, 2022), <https://www.space.com/space-station-dodges-russian-satellite-debris>.

<sup>83</sup> G.A. Res. A/RES/62/217 (Dec. 22, 2007). See also OFF. FOR OUTER SPACE AFFS., SPACE DEBRIS MITIGATION GUIDELINES OF THE COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE (2010), [https://www.unoosa.org/pdf/publications/st\\_space\\_49E.pdf](https://www.unoosa.org/pdf/publications/st_space_49E.pdf).

<sup>84</sup> G.A. Res. A/69/438 (Dec. 12, 2014).

<sup>85</sup> G.A. Res. A/70/495 (Nov. 12, 2015).

<sup>86</sup> G.A. Res. A/76/231 (Dec. 24, 2021); see also Mary Ann Hurtado, *UN Panel Approves Working Group on Space*, ARMS CONTROL ASS'N (Dec. 2021), <https://www.arm-control.org/act/2021-12/news/un-panel-approves-working-group-space>.

<sup>87</sup> G.A. Res. A/C.1/77/L.62 (Oct. 13, 2022).

### C. Conference on Disarmament

As previously mentioned, the five international agreements regulating space activities have been adopted through COPUOS. However, the Committee is not the only UN forum dealing with space activities. Since the 1980s, the specific issue of disarmament in outer space has been overseen by the Conference on Disarmament (CD), a deliberative body established by the UN General Assembly with the objective of finding feasible solutions to achieve global disarmament.<sup>88</sup> Thus far, the CD has been unable to reach consensus on norms regulating the weaponization of outer space.

Since 2008, China and Russia have jointly sponsored a Draft Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT).<sup>89</sup>

The draft was widely criticized, *inter alia*, for its arbitrary clarification of some terms which are still widely debated. For instance, Article I of the PPWT proposes definitions such as:

the demarcation of “outer space” as the space beyond 100 km above sea level;<sup>90</sup>

an outer space object as “any device, designated for functioning in outer space” whether orbiting celestial bodies or stationed therein, thus following a functionalistic approach;<sup>91</sup>

“weapons in outer space” as “any device placed in outer space...specially produced or converted to eliminate, damage or disrupt normal function of objects in outer space, on the Earth or in its air, as well as to eliminate population, components of biosphere critical to human existence or inflict damage to them.”<sup>92</sup> According to the draft treaty, weapons were considered “placed” in outer space if orbiting the Earth at least once or following a section of such an orbit before leaving Earth

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<sup>88</sup> G.A. Res. A/RES/S-10/2 (June 30, 1978).

<sup>89</sup> 2008 PPWT *supra* note 14.

<sup>90</sup> *Id.* at art. I (a).

<sup>91</sup> *Id.* at art. I(b).

<sup>92</sup> *Id.* at art. I(c).

orbit, or if “stationed on a permanent basis somewhere in outer space,”<sup>93</sup> and

the “use of force” or “the threat of force” as actions aiming at the destruction and damage of outer space objects.<sup>94</sup>

Article II prohibits States Parties from placing objects carrying weapons in orbit or installing them on celestial bodies. It also prevents States from using or threatening to use force against outer space objects and prohibits facilitating other States or organizations from taking part in activities banned under the Treaty.<sup>95</sup> However, Article V provides for an escape clause in cases of self-defense as in accordance with Article 51 of the UN Charter.<sup>96</sup>

The draft does not cover verification mechanisms. Article VI promotes confidence building measures, delegating the creation of an *ad hoc* instrument to an additional protocol.<sup>97</sup> However, the draft Treaty does not require States Parties to draft such protocol, leaving compliance mechanisms in the hands of an executive organization, tasked with *inter alia* observing States’ behaviors, examining their compliance to the Treaty provisions and adopting measures to end violations.<sup>98</sup>

Furthermore, the amendment clause contained in the draft Treaty radically differed from the same clause contained in the five space treaties. While in the UN instruments proposed amendments apply only to States ratifying them after the approval of the text by the majority of States Parties,<sup>99</sup> in the PPWT, amendments apply to every State Party if approved by the majority of the States Parties to the Treaty.<sup>100</sup>

The Permanent Representative of the United States contested the PPWT on several grounds.<sup>101</sup> An example is the possibility of

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<sup>93</sup> *Id.* at art. I(d).

<sup>94</sup> *Id.* at art. I(e).

<sup>95</sup> 2008 PPWT, *supra* note 14, art. II.

<sup>96</sup> *Id.* at art. V.

<sup>97</sup> *Id.* at art. VI.

<sup>98</sup> *Id.* at arts. VI & VIII.

<sup>99</sup> Outer Space Treaty at Art. XV; Rescue and Return Agreement at Art. 8; Liability Convention at Art. XXV; Registration Convention at Art. IX; Moon Agreement at Art. 17.

<sup>100</sup> 2008 PPWT, *supra* note 14, Art. X.

<sup>101</sup> Conference on Disarmament, *Letter Dated 19 August 2008 from the Permanent Representative of the United States of America Addressed to the Secretary-General of the*

invoking Article 51 of the UN Charter, without explaining how the self-defense provision could be read in light of the general obligation contained in the PPWT to refrain from resorting to the use of force against space objects.<sup>102</sup> Secondly, the draft makes no distinction between “use of force” and “threat of force”;<sup>103</sup> it is unclear whether the term “threat of force” could encompass the development of ASAT capabilities without their deployment, or if the destruction of one’s own space object could constitute a “threat” for the purpose of the Treaty.<sup>104</sup> Further, the PPWT does not regulate the development, testing and deployment of ASAT and other Earth-based weapons able to target satellites, which represent serious threats to space objects.<sup>105</sup> In addition, the establishment of the Executive Organization as body operating outside the UN Framework and with no provided detail on the measures to be adopted in cases of violations, would constitute an important and unjustified depart from the UN dispute resolution mechanisms.<sup>106</sup> Indeed, while executive organizations established to tackle issues relating to the interpretation of treaties do exist, they operate under the auspices of the UN.<sup>107</sup> The last significant point of criticism regards the amendment procedure, which would bind States Parties even if they did not wish to approve new amendments.<sup>108</sup>

While the revised version of the PPWT erased the definition of “outer space,” recognized the “need to elaborate control measures” and introduced an amendment procedure by consent,<sup>109</sup> the Sino-Russian amended draft does not distance itself from the previous

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*Conference Transmitting Comments on the Draft “Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force Against Outer Space Objects (PPWT)” as Contained in Document CD/1839 Of 29 February 2008*, U.N. Doc. CD/1847 (Aug. 26, 2008), available at: <https://digitallibrary.un.org/record/637449>. [hereinafter US PPWT Letter].

<sup>102</sup> *Id.* ¶ 6.

<sup>103</sup> *Id.*

<sup>104</sup> *Id.*

<sup>105</sup> *Id.* ¶ 9.

<sup>106</sup> *Id.* ¶¶ 14-16.

<sup>107</sup> *Id.*

<sup>108</sup> *Id.* ¶ 17.

<sup>109</sup> UNITED NATIONS OFF. FOR DISARMAMENT AFFS., EXPLANATORY NOTE ON THE UPDATED DRAFT TREATY ON THE PREVENTION OF THE PLACEMENT OF WEAPONS IN OUTER SPACE, THE THREAT OR USE OF FORCE AGAINST OUTER SPACE OBJECTS (2014), available at: [https://docs-library.unoda.org/Conference\\_on\\_Disarmament\\_\(2014\)/1319%2BRussian%2BFederation%2BExplanatory%2Bnote%2Bupdated%2Bdraft%2BPPWT.pdf](https://docs-library.unoda.org/Conference_on_Disarmament_(2014)/1319%2BRussian%2BFederation%2BExplanatory%2Bnote%2Bupdated%2Bdraft%2BPPWT.pdf).

proposal and does not clarify the meaning of “threat” and “use of force in space”. In addition, as pointed out by Ambassador Robert A. Wood, US Permanent Representative at the CD, Chinese and Russian behaviors seem in sharp contrast with the aim of the PPWT and with the intention of strengthening trust-building mechanisms.<sup>110</sup> Some scholars argue that both countries’ development and testing of ASAT technology comes as a response to US ballistic missile defense systems. Thus, their actions would be fully justified under a military standpoint, also considering the US reluctance to settle the issue.<sup>111</sup> The criticism to the PPWT raised by US representatives is legitimate. However, it is undeniable that no alternative draft has ever been proposed to the CD, either by the US or its partners. Conversely, there is a tendency to use more aggressive tones, which, in some instances, could be read in light of the intention to assert “space dominance.”<sup>112</sup> Over the last decade, space has been progressively recognized as *congested*, *contested* and *competitive*. However, this vision seems to ignore “the other “c” word that had figured prominently in the past human activity in space: cooperation”, as Mayer puts forth<sup>113</sup>. In more recent declarations by the Trump Administration, space was described as “a new warfighting domain”<sup>114</sup>, making clear that “we must have American dominance in space”<sup>115</sup>. Even though the launch of the Artemis Program and the Artemis Accords resumed cooperation among like-minded countries, this characterization of the domain risks hindering diplomatic

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<sup>110</sup> U.S. Mission Geneva, *United States Remarks for Conference on Disarmament Subsidiary Body 3 – Prevention of an Arms Race in Outer Space, as Delivered by Advisor Michael Aho*, U.S. MISSION TO INT’L ORGS. IN GENEVA (Mar. 22, 2022), [https://geneva.usmission.gov/2022/03/22/cd-prevention-of-an-arms-race-in-space/?\\_ga=2.4955381.736132293.1674154373-123992891.1674154373](https://geneva.usmission.gov/2022/03/22/cd-prevention-of-an-arms-race-in-space/?_ga=2.4955381.736132293.1674154373-123992891.1674154373) [hereinafter Aho Remarks].

<sup>111</sup> Alexey Arbatov, *Arms Control in Outer Space: The Russian Angle, and a Possible Way Forward*, 75 BULLETIN OF THE ATOMIC SCIENTISTS 151, 152 (2019).

<sup>112</sup> Paul Meyer, *Diplomacy: The Missing Ingredient in Space Security*, in WAR AND PEACE IN OUTER SPACE: LAW, POLICY, AND ETHICS 287, 294 (Cassandra Steer & Matthew Hersch, eds., 2021).

<sup>113</sup> *Id.* at 295.

<sup>114</sup> BBC, *SpaceCom: Trump Launches Space Warfare Command* (Aug. 30, 2019) <https://www.bbc.com/news/world-us-canada-49518612>.

<sup>115</sup> Remarks by President Trump at a Meeting with the National Space Council and Signing of Space Policy Directive-3 (June 18, 2018) <https://trumpwhitehouse.archives.gov/briefings-statements/remarks-president-trump-meeting-national-space-council-signing-space-policy-directive-3/>.



efforts on a wider scale and exacerbating existing mistrusts among competing actors.

As humanity becomes more reliant on space-based technologies, the need to ensure peaceful activities in orbit seems even more pressing. This highlights the importance of diplomatic consultations on the issue of PAROS within and outside international fora. While there appears to be a shared sense of urgency on the matter, countries disagree as to which means—soft or hard law—are best suited to address the issue. Advanced space-faring states seem to be unwilling to accept limits to their dual use technologies without being able to clearly assess other countries' actions and intentions. In their view, committing to binding provisions without enforcement and control mechanisms would entail losing strategic advantages<sup>116</sup>. Thus, the approach of the Global North, led by the US, favours non-legally binding rules of behavior and confidence building measures<sup>117</sup>. On the other hand, the Sino-Russian position is focused on preventing an arms race in space, supporting the development of treaty law<sup>118</sup>. This crucial divergence renders advancements in diplomatic endeavors difficult to achieve, also because of the existing disagreements over a clear definition of “weapon” in space. As contended by Liu and Tronchetti, while China and Russia support a restrictive interpretation, limited to objects stationed in orbit<sup>119</sup>, as underscored in the PPWT, European countries propose a wider definition of weapon which encompasses Earth-based technology<sup>120</sup>, also including terrestrial technology capable of damaging satellites and their functioning.

Thus far, the two different approaches appear to be mutually exclusive, and the current geopolitical climate does not support diplomatic endeavors to tackle the most urgent space challenges.

It is worth noting, that the situation was not so different in the 1960s, when distrust and competition characterized international relations, yet countries were able to find common grounds.

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<sup>116</sup> Kaul, *supra* note 77, at 53.

<sup>117</sup> Tronchetti, *supra* note 9, at 379.

<sup>118</sup> Meyer, *supra* note 112, 290; see also Tronchetti, *supra* note 9, at 378.

<sup>119</sup> H. Liu, F. Tronchetti, *United Nations Resolution 69/32 on the “No First Placement of Weapons in Space:” A Step Forward in the Prevention of an Arms Race in Outer Space?* 38 SPACE POL'Y 64, 65 (2016).

<sup>120</sup> *Id.*

Steps forward appear to have been made. President Biden's Administration unilaterally committed to refrain from testing any new ASAT weapon, and there has been a revival of engagement in the appropriate multilateral fora to discuss space security issues. The creation of the Working Group on Space Threats and the adoption of UNGA Resolution *Destructive Direct-Ascent Anti-Satellite Missile Testing*, calling on states to stop conducting D-ASAT operations and resume discussions on PAROS, exemplify this trend. These actions might commence a process of consensus-building that could eventually lead to the adoption of binding measures.

### III. NATO'S FIFTH OPERATIONAL DOMAIN

NATO's engagement in outer space is nearly as old as the space race itself. The cooperation between the United States and NATO began in 1966, followed by the adoption of the SATCOM project in 1967.<sup>121</sup> The fruitful SATCOM partnership among Italy, the United Kingdom, the US, Germany, Belgium, and the Netherlands led to the launch of four NATO satellites: PR/CP(70)2 and PR/CP(71)1 in 1970 and 1971, and NATO IVA and NATO IBV in 1991 and 1993.<sup>122</sup> At the beginning of the 21<sup>st</sup> century, NATO stopped developing and launching its own space objects and started relying on Allies' assets, especially from Italy, France and the United Kingdom.<sup>123</sup>

Through Earth observation, signal intelligence, satellite communications, disaster management, and space situational awareness, space technology can serve military and civilian uses, enhancing the Alliance's ability to anticipate and respond to potential threats<sup>124</sup> on Earth and in space. The latter can amount to low-end non-kinetic systems with reversible effects (for instance, jamming), and to non-kinetic and high-end kinetic that produce irreversible effects,<sup>125</sup> such as ASAT technology.

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<sup>121</sup> *NATO, We Have Lift Off!*, N. ATL. TREATY ORG., [https://www.nato.int/cps/fr/natohq/declassified\\_138278.htm](https://www.nato.int/cps/fr/natohq/declassified_138278.htm), (last accessed Oct. 22, 2023).

<sup>122</sup> *Id.*

<sup>123</sup> *Id.*

<sup>124</sup> NATO's Overarching Space Policy (June 27, 2019) available at: [https://www.nato.int/cps/da/natohq/official\\_texts\\_190862.htm](https://www.nato.int/cps/da/natohq/official_texts_190862.htm) (last visited December 16, 2023)[hereinafter NATO's Overarching Space Policy].

<sup>125</sup> *Id.*

As the number of space-faring nations rises, issues of orbital congestion and growing competitiveness emerge, directly contributing to increasing the risks associated with operations in the domain. Against this backdrop, the proliferation of space actors and of industrial capabilities—particularly dual use—challenges the Alliance’s technological superiority<sup>126</sup>.

In a domain characterized by an increasing relation with defense, a more prominent role of the world most advanced defensive alliance is of the utmost importance. It is therefore not surprising that NATO Members—among the most technologically developed spacefaring countries and military powers<sup>127</sup>—wish to enhance the Alliance’s cooperation in outer space. The 2019 London Declaration which recognized space as the fifth operational domain exemplifies such effort.<sup>128</sup> As a testimony of NATO’s commitment to boost cooperation in orbit, NATO’s Space Center was established in 2020, with the aim of coordinating activities with national entities.<sup>129</sup> This enabled the Alliance to effectively integrate space technology in different military exercises as early as 2021.<sup>130</sup> Furthermore, in 2021 the Alliance announced the intention to develop a Strategic Space Situational Awareness System at the Headquarters in Brussels and a NATO Center of Excellence dedicated to outer space in Toulouse, France.<sup>131</sup>

NATO’s cooperation efforts are also reflected in the joint statement signed with Luxemburg for the development of a Strategic Space Situational Awareness System in the Situation Centre’s

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<sup>126</sup> Elio Calcagno, *NATO and Its Members: A Space Alliance?*, in *THE EXPANDING NEXUS BETWEEN SPACE AND DEFENCE* 1, 33-34 (Alessandro Marrone & Michele Nones eds., 2022).

<sup>127</sup> Sinéad Baker & Thibault Spirlet, *The World’s Most Powerful Militaries in 2023, Ranked*, INSIDER (Aug. 24, 2023), <https://www.businessinsider.com/ranked-world-most-powerful-militaries-2023-firepower-us-china-russia-2023-5>.

<sup>128</sup> London Declaration Issued by the Heads of State and Governments Participating in the Meeting of the North Atlantic Council in London, 3-4 December 2019, available at: [https://www.nato.int/cps/en/natohq/official\\_texts\\_171584.htm](https://www.nato.int/cps/en/natohq/official_texts_171584.htm).

<sup>129</sup> N. ATL. TREATY ORG., SECRETARY GENERAL’S ANNUAL REPORT 2021 (2021), [https://www.nato.int/nato\\_static\\_fl2014/assets/pdf/2022/3/pdf/sgar21-en.pdf](https://www.nato.int/nato_static_fl2014/assets/pdf/2022/3/pdf/sgar21-en.pdf).

<sup>130</sup> *Id.* at 28

<sup>131</sup> *Id.*

Geospatial Section at NATO's Headquarters, which will help understand space events and study space objects.<sup>132</sup>

The principles behind the Alliance's engagement in outer space are provided for in NATO's Overarching Space Policy 2022.<sup>133</sup> The Alliance appears to have no interest in becoming a space actor or in developing its own space capabilities.<sup>134</sup> Instead, its main goal is engaging with NATO's members to enhance cooperation for the defense of common space assets.<sup>135</sup> In doing so, the Alliance will follow the internationally recognized principles contained in the Outer Space Treaty: freedom of exploration, peaceful use of outer space and rejection of national appropriation by claims of sovereignty.<sup>136</sup>

According to the Overarching Space Policy 2022, NATO's engagement in space activities will be concentrated *inter alia* in collective defense, crisis management, support of NATO's operations, and military and political consultations.<sup>137</sup> To do so, Allies will provide capabilities in space situational awareness, surveillance and reconnaissance, satellite communication, position navigation and timing and early warning.<sup>138</sup>

NATO space partnership will be fully voluntary, linking its effectiveness to partners' willingness to distribute technology and acquired data.<sup>139</sup>

Considering the added value of outer space to NATO Partners, and the perils that unethical and aggressive behaviors in space may pose to the stability and security of the Alliance, attacks to and from outer space could trigger the mutual defense clause contained in Article 5 of the North Atlantic Treaty.<sup>140</sup> Because of the wide cluster of attacks that could damage space capabilities—reversibly and irreversibly—and the difficulty of attributing responsibility for possible attacks, the North Atlantic Council will resort to a case-by-

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<sup>132</sup> *Id.* See also *NATO and Luxembourg Boost Alliance Space Situational Awareness*, NATO (June. 14, 2021) [https://www.nato.int/cps/fr/natohq/news\\_185365.htm?selected-Locale=en](https://www.nato.int/cps/fr/natohq/news_185365.htm?selected-Locale=en).

<sup>133</sup> NATO's Overarching Space Policy, *supra* note 124.

<sup>134</sup> *Id.* ¶ 5(g).

<sup>135</sup> *Id.* ¶ 7.

<sup>136</sup> *Id.* ¶ 5; See also *NATO, We Have Lift Off!*, *supra* note 121.

<sup>137</sup> NATO's Overarching Space Policy, *supra* note 124, at ¶ 6.

<sup>138</sup> *Id.* ¶ 7.

<sup>139</sup> *Id.* ¶ 5.

<sup>140</sup> The North Atlantic Treaty, April 4, 1949, Art. 5.

case approach.<sup>141</sup> Potentially, this cooperation could stimulate the Alliance in adopting a shared definition of armed attack in outer space,<sup>142</sup> which may contribute to the international debate on PAROS.

#### IV. THE ASIA-PACIFIC REGION WITHIN SPACE COOPERATION AND COMPETITION

The Asian continent is home to a large number of spacefaring nations; however, the strong regional competition translates into the desire to strengthen ties with allies and propose different cooperation models. This reality is evident in every field, from infrastructure building and management through the Belt and Road Initiative and the Quadrilateral Security Dialogue,<sup>143</sup> to outer space. On the one hand, Indian-Japanese cooperation is based on multilateral voluntary exchange of information through the Asia-Pacific Regional Space Agency Forum (APRSAF) and the Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP). On the other, the Chinese model takes the form of a binding agreement through the Asia-Pacific Space Cooperation Organization (APSCO).<sup>144</sup>

Established in 1993 as a forum to enhance peaceful uses of outer space, APRSAF is now the largest conference on space activities in the Asia-Pacific and collaborates with a wide array of actors, from universities to international organizations and national space agencies<sup>145</sup>—particularly the Japan Aerospace Exploration Agency (JAXA)—to strengthen multilateral cooperation on space technological advancements.

The rapid development of China as a global actor and powerful spacefaring State, is witnessed by the establishment of APSCO, through which the country cultivates multilateral cooperation in

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<sup>141</sup> NATO's Overarching Space Policy, *supra* note 124, at ¶ 12.

<sup>142</sup> Calcagno, *supra* note 126, at 38.

<sup>143</sup> See Yun Zhao, *The Role of Regional Space Cooperation in Procuring Space Security in the Asia-Pacific Region*, in INTERNATIONAL GOVERNANCE AND THE RULE OF LAW IN CHINA UNDER THE BELT AND ROAD INITIATIVE (2018).

<sup>144</sup> *Id.*

<sup>145</sup> See *Countries and Regions*, ASIA-PAC. REG'L SPACE AGENCY F., <https://www.aprsaf.org/participants/> (last visited July 30, 2023) (stating that there were, "[a]s of November 2019, 844 organizations from 52 countries and regions, and 32 international organizations").

the region. APSCO was founded in 2005 as a non-profit inter-governmental space organization with full international legal status.<sup>146</sup> The main objectives of the organization are listed in Article 4 of its Convention: APSCO aims, *inter alia*, to promote and strengthen collaborative space programs among Member States, assist Members in space technological research and application “by elaborating and implementing space development policies,”<sup>147</sup> promote cooperation in space technology and application, and contribute to the peaceful uses of outer space.<sup>148</sup> APSCO is funded on the concept of “fair return,” ensuring participation to projects in an equitable manner with the purpose of creating a competitive space industry.<sup>149</sup> Article 6 lists the “establishment of a central data bank for development of programs of the Organization and dissemination of technical and other information relating to the programs and activities of the Organization”<sup>150</sup> as another focal area APSCO. Contrary to APRSAF, this cooperation is not on a voluntary basis. However, Member States can refrain from exchanging information with the organization—and vice-versa—if the exchange risks jeopardizing national security or agreements with third parties.<sup>151</sup> While States’ refusal to transfer sensitive information for security purposes is easily understandable, the idea that an international organization could operate disregarding transparency towards its Member States is indeed questionable.

Eight countries are APSCO Members: Türkiye, Mongolia, Pakistan, Thailand, Peru, Iran, China and Bangladesh,<sup>152</sup> and the organization’s headquarter is in Beijing.<sup>153</sup> The case of Türkiye is particularly interesting as the country demonstrates the intention to find a balance between its security interests and commitments as a

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<sup>146</sup> Convention of the Asia Pacific Space Cooperation Organisation (APSCO), Oct. 28, 2005, 2423 U.N.T.S. 127, <https://treaties.un.org/doc/Publication/UNTS/Volume%202423/v2423.pdf>.

<sup>147</sup> *Id.* at art. 4.

<sup>148</sup> *Id.*

<sup>149</sup> *Id.* at art. 5.

<sup>150</sup> *Id.* at art. 6.

<sup>151</sup> *Id.* at art. 21.

<sup>152</sup> *Member States*, ASIA-PAC. SPACE COOP. ORG., [http://www.apsco.int/html/comp1/channel/Member\\_States/25.shtml](http://www.apsco.int/html/comp1/channel/Member_States/25.shtml) (last visited July 30, 2023).

<sup>153</sup> *Asia Pacific Space Cooperation Organisation (APSCO)*, OFF. FOR OUTER SPACE AFFS. UN-SPIDER KNOWLEDGE PORTAL, <https://www.un-spider.org/asia-pacific-space-cooperation-organisation-apsco> (last visited July 30, 2023).

NATO Member, and a stronger cooperation with APSCO Countries. Arguably, the environment of growing international mistrust—expressed in the new discourse surrounding space activities—will prove challenging for Istanbul.

Among its Member States, only China, Pakistan and Iran elaborate significant space policies and programs.<sup>154</sup> The organization is a Permanent Observer at COPUOS and collaborates with several UN institutions such as the UN Platform for Space-Based Information for Disaster Management and Emergency Response (UNSPIDER) and the United Nations Office for Outer Space Affairs (UNOOSA). Dialogue extends to about thirty countries and a wide number of universities and international organizations.<sup>155</sup>

APSCO is engaging in six cooperative programs.<sup>156</sup> Among them are the Data Sharing Service Platform (DSSP), a program aimed at enhancing data sharing among Member States through the creation of a platform managed by a Chinese company,<sup>157</sup> and the Joint Small Multi-Mission Satellites (SMMS) Constellation Program, through which countries share services and improve space capability. By providing three satellites, China is the greatest contributor to the constellation program, while Pakistan, Peru and Türkiye will provide three satellites as a communal effort.<sup>158</sup>

Presently, APSCO is the only regional space organization on the continent. It is plausible that in the near future it could expand and play a leading role in harmonizing regional standards in outer space. Such an outcome is desirable as enhancing regional cooperation could help manage general distrust and resolve major security threats. Indeed, “regional space cooperation and regional space

<sup>154</sup> Malay Adhikari, *Impact of Outer Space Treaty on Few Observer Organisations in COPUOS*, in *FIFTY YEARS OF THE OUTER SPACE TREATY: TRACING THE JOURNEY* 140, 145 (Ajey Lele ed., 2017).

<sup>155</sup> Asia-Pacific Space Cooperation Organisation, *International Cooperation*, (visited July, 30, 2023) [http://www.apsco.int/html/comp1/content/International\\_Cooperation/2019-02-21/17-252-1.shtml](http://www.apsco.int/html/comp1/content/International_Cooperation/2019-02-21/17-252-1.shtml).

<sup>156</sup> APSCO’s official website does not provide information as to the advancement of the listed programs and has not been updates since 2019.

<sup>157</sup> *Cooperative Programs Data Sharing Service Platform*, ASIA-PAC. SPACE COOP. ORG., <http://www.apsco.int/html/comp1/content/DataSharingServiceNetwork/2018-07-06/62-184-1.shtml> (last visited July 30, 2023).

<sup>158</sup> *Cooperative Programs Space Segment Network and Interconnection Ground Systems*, ASIA-PAC. SPACE COOP. ORG., <http://www.apsco.int/html/comp1/content/SSNandIGS/2019-02-28/43-259-1.shtml> (last visited July 30, 2023).

security are both mutually compatible and interdependent.”<sup>159</sup> However, before being able to become a large-scale regional international organization, APSCO should improve its transparency and clarify on which grounds it may retain information in accordance with Article 21 of the APSCO Convention, especially since regional competitors may perceive the organization as Chinese-centric.

Despite the existence of programs of regional cooperation, the Asian-Pacific is undergoing a moment of serious mistrust, translating to a collective growth of military investments. It is estimated that Japan’s expenditures in defense will rise by 26.3% in 2023 and that part of the new budget will be dedicated to “cross-domain operational capabilities” both in outer space and cyberspace.<sup>160</sup> Similarly, India is promoting and investing large sums in “Make in India”<sup>161</sup> to create a self-sustainable military industry.<sup>162</sup>

Considering the military technological capabilities that the most advanced Asian spacefaring countries possess,<sup>163</sup> every cooperation effort needs to be understood in light of the regional competition which characterizes the continent. Enhancing cooperation through multilateral instruments is an exercise of soft law power even when those instruments are not binding but voluntary—especially due to the possible dual use of the space technology on which cooperation projects rely. Bearing in mind the mutual distrust in the continent and the increase of military arsenals in the Asia-Pacific region, improving transparency and confidence-building measures is of the utmost importance.

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<sup>159</sup> Zhao, *supra* note 143, at 254.

<sup>160</sup> Takahashi Kosuke, *Japan Approves 26.3% Increase in Defense Spending for Fiscal Year 2023*, DIPLOMAT (Dec. 24, 2022), <https://thediplomat.com/2022/12/japan-approves-26-3-increase-in-defense-spending-for-fiscal-year-2023/>.

<sup>161</sup> Dinakar Peri, *Union Budget 2022 | Marginal Hike in Defence Budget, Emphasis on Make in India*, THE HINDU (Feb. 1, 2022), <https://www.thehindu.com/business/budget/union-budget-2022-marginal-hike-in-defence-budget-emphasis-on-make-in-india/article38358783.ece>.

<sup>162</sup> Vivek Raghuvanshi, *India Unveils New Defense Budget Aimed at Promoting a Self-Reliant Industry*, DEFENSE NEWS, (Feb. 3, 2022), <https://www.defensenews.com/global/asia-pacific/2022/02/03/india-unveils-new-defense-budget-aimed-at-promoting-a-self-reliant-industry/>.

<sup>163</sup> China and India possess and have tested ASAT weapons. See Kaul, *supra* note 77. See also Tellis, *supra* note 81.



## V. SPACE COOPERATION ON THE AFRICAN CONTINENT

While Asian countries have successfully promoted space cooperation through fora and organizations, the African continent is still establishing and enhancing multilateral efforts. The development of a regional cooperation program is still in its first stages, as space activities have typically been carried out by means of bilateral agreements with non-African nations<sup>164</sup>. However, space science and application is turning into a fundamental tool to enhance telecommunication technology and internet coverage, as well as to address resource scarcity<sup>165</sup>. This growing importance is stimulating investments and activities in orbit. In fact, in 2020 the continent accounted for 0.7% of global space expenditure, nearly twice the budget allocated in 2018<sup>166</sup>.

The African space industry is a promising sector, worth about USD 19 billion in 2021 and estimated to witness a 16% increase by 2026, reaching USD 22.64 billion.<sup>167</sup>

As of 2023, about 20 African countries established a space program and around 30 have developed or are in the process of designing and launching at least one satellite<sup>168</sup>. Among them, South Africa and Nigeria have robust space capabilities—as of 2023 they have launched 13 and 7 satellites, respectively<sup>169</sup>—and are aiming at establishing a position of leadership in the continent.<sup>170</sup>

South Africa is the most advanced spacefaring country in the region. Despite its long history of space activities—it launched the first African-built satellite in 1999—the South African National Space Policy, which created the South African National Space

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<sup>164</sup> See M. Ansdell, L. Delgado, & D. Hendrickson, *Analyzing the Development Paths of Emerging Space Nations: Opportunities or Challenge for Space Sustainability?*, ILL. STATE UNIV. (Apr. 2011), [https://isulibrary.isunet.edu/doc\\_num.php?explnum\\_id=448](https://isulibrary.isunet.edu/doc_num.php?explnum_id=448).

<sup>165</sup> Ayooluwa Adetola, *NewSpace Africa Conference 2023 to Hold in April 2023 in Abidjan, Ivory Coast*, SPACE IN AFRICA (Oct. 21, 2022), <https://africanews.space/newspace-africa-conference-2023-to-hold-in-april-2023-in-abidjan-ivory-coast/>.

<sup>166</sup> J. M. Klinger, T. I. Oniosun, *China's Space Collaboration with Africa: Implications and Recommendations for the United States*, US INSTITUTE OF PEACE (Sept. 2023) [https://www.usip.org/sites/default/files/2023-09/sr-524\\_china-space-collaboration-africa-implications-recommendations-for-us.pdf](https://www.usip.org/sites/default/files/2023-09/sr-524_china-space-collaboration-africa-implications-recommendations-for-us.pdf)

<sup>167</sup> Adetola, *supra* note 165.

<sup>168</sup> Klinger, *supra* note 166, at 8.

<sup>169</sup> *Id.* at 7.

<sup>170</sup> Ansdell, *supra* note 164.

Agency (SANSA), was published only in 2008.<sup>171</sup> The National Policy aims to make South Africa the leading space nation by encouraging sustainable development of the domestic space industry.<sup>172</sup>

Similarly, Nigeria possesses a strong position in the continent and is planning to further develop its capabilities. Indeed, Nigeria's National Space Policy describes space as an important instrument in the country's development and a fundamental tool in transforming the country "from the status of a consumer nation to an active participant in space technology".<sup>173</sup> The leading entity dealing with space activities is the National Space Research and Development Agency (NASRDA) which has extensively cooperated with international partners—particularly the UK and China—to develop and launch remote sensing and communication satellites.<sup>174</sup>

While Nigeria's reliance on foreign actors renders its spacecraft portfolio more comprehensive, South Africa's efforts are concentrated in the development of indigenous spacecrafts<sup>175</sup>. If on the one hand this approach increases domestic reliance, on the other it reduces the country's manufacturing capabilities.

Both nations' approaches to outer space activities and goals are similar, as they share the common objective of boosting the development of their domestic industries and ameliorating their populations' living conditions.<sup>176</sup> To this end, their cooperation is reflected in the intra-African activities which started to emerge in the last decade, such as the African Resources and Environmental Management Satellite Constellation (ARMC),<sup>177</sup> the African Space Leadership Conference (ASLC)<sup>178</sup> and also the Space Law for New

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<sup>171</sup> Department of Trade and Industry Republic of South Africa, *National Space Policy* (Dec. 2008) <https://www.unoosa.org/documents/pdf/spacelaw/national/safrica/nat-policyE.pdf>

<sup>172</sup> *Id.* at foreword by Mandisi Mpahlwa, Minister of Trade and Industry.

<sup>173</sup> *National Space Policy* 2001, at 1, available at: <http://www.dawodu.com/space.pdf>.

<sup>174</sup> Ansdell, *supra* note 164.

<sup>175</sup> *Id.*

<sup>176</sup> *Id.* at 21.

<sup>177</sup> Adetola, *supra* note 165.

<sup>178</sup> *8th African Space Leadership Conference Focusses on Space Science and Technology for Sustainable Development*, OFF. FOR OUTER SPACE AFFS. UN-SPIDER KNOWLEDGE PORTAL (Dec. 12, 2019), <https://www.un-spider.org/news-and-events/news/8th-african-space-leadership-conference-focusses-space-science-and-technology>.

Space Actors project created by UNOOSA.<sup>179</sup> These projects aim at increasing coordination in the region and multilateral talks, while stimulating technical capabilities. The Space Law for New Space Actors program, in particular, is intended to support countries in drafting national space legislations in conformity with outer space treaties, fostering peaceful uses of outer space and achieving long-term sustainability.<sup>180</sup> Kenya Space Agency (KSA) is now collaborating with the project through a technical mission in Nairobi focused on increasing know-how and legal education.<sup>181</sup>

The establishment of the African Space Agency in 2019 was a great step forward in inter-African space cooperation. The African Union Commission created the agency so as to actively promote the expansion of the African space industry and address “common development challenges.”<sup>182</sup> The African Space Agency is vested with the obligation of *inter alia* promoting and coordinating the implementation of programs, supporting Member States in adopting space policies, and fostering regional coordination.<sup>183</sup>

Notwithstanding the growing interest in developing African space policies and programs, African actors have been approaching the space domain—or establishing their positions—through bilateral cooperation with powerful spacefaring countries and private companies. For instance, in 2019, Angola and Russia signed an agreement on research and peaceful uses of outer space to build a stronger cooperation in telecommunications and space navigation.<sup>184</sup> Using Roscosmos, the Russian State Corporation for State

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<sup>179</sup> See *Space Law for New Space Actors Project*, OFF. FOR OUTER SPACE AFFS., <https://www.unoosa.org/oosa/en/ourwork/spacelaw/capacitybuilding/advisory-services/index.html> (last visited Dec. 20, 2023).

<sup>180</sup> *Id.*

<sup>181</sup> Mustapha Iderawumi, *UNOOSA and KSA Collaborate under Space Law for New Space Actors Project*, SPACE IN AFRICA (Nov. 30, 2022), <https://africanews.space/unoosa-and-ksa-collaborate-under-space-law-for-new-space-actors-project/>.

<sup>182</sup> AFRICAN SPACE AGENCY, STATUTE OF THE AFRICAN SPACE AGENCY Preamble (2018), [https://au.int/sites/default/files/treaties/36198-treaty-statute\\_african\\_space\\_agency\\_e.pdf](https://au.int/sites/default/files/treaties/36198-treaty-statute_african_space_agency_e.pdf).

<sup>183</sup> *Id.* at art. 5.

<sup>184</sup> Space in Africa, *Russia and Angola Sign Agreement on Space Research*, SPACE IN AFRICA (Apr. 23, 2019), <https://africanews.space/russia-and-angola-sign-agreement-on-space-research/>.

Activities and Russian launching facilities, Angola launched its second communications satellite in October 2022.<sup>185</sup>

Furthermore, African nations are boosting cooperation with China by taking part in the Belt and Road Initiative. In 2022, Algeria<sup>186</sup> and China signed a five-year strategic agreement to enhance bilateral relations on several fields, including outer space.<sup>187</sup> Moreover, China and the African Union Commission organized an event—Talk with Taikonauts—to educate students from Namibia and other African nations about life in space and to strengthen China-Africa partnerships.<sup>188</sup> During the event, China announced its intention to build a satellite digital-receiving ground station in Namibia.<sup>189</sup>

Western spacefaring nations are also intensifying efforts to sign partnership agreements with African nations. For instance, the United States is promoting global cooperation through the Artemis Accords. Nigeria and Rwanda signed in 2022, becoming the first African nations to join the Artemis Accords.<sup>190</sup>

Italy is another global actor involved in fostering space diplomacy in Africa, as demonstrated by the 2023 Memorandum of Understanding between Italy and Algeria. Rome and Algiers' partnership will focus on strengthening peaceful outer space exploration, EO and space technology, as well as infrastructural projects, training programs and know-how sharing.<sup>191</sup>

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<sup>185</sup> Joshua Faleti, *Angosat-2 Set to Launch on Wednesday 12 October 2022*, SPACE IN AFRICA (Oct. 4, 2022), <https://africanews.space/angosat-2-set-to-launch-on-wednesday-12-october-2022/>.

<sup>186</sup> Algeria is a party to the Belt and Road Initiative as of September 2018. See Ayooluwa Adetola, *Algeria Signs 5-Year Strategic Cooperation Agreement with China*, SPACE IN AFRICA (Nov. 9, 2022), <https://africanews.space/algeria-signs-5-year-strategic-cooperation-agreement-with-china/>.

<sup>187</sup> Faleti, *supra* note 185.

<sup>188</sup> Mustapha Iderawumi, *China Set to Build a Satellite Digital-Receiving Ground Station in Namibia*, SPACE IN AFRICA (Oct. 23, 2022), <https://africanews.space/china-set-to-build-a-satellite-digital-receiving-ground-station-in-namibia/>.

<sup>189</sup> *Id.*

<sup>190</sup> Cheryl Warner, *NASA Welcomes Nigeria, Rwanda as Newest Artemis Accords Signatories* (Dec. 12, 2022), <https://www.nasa.gov/missions/artemis/nasa-welcomes-nigeria-rwanda-as-newest-artemis-accords-signatories#:~:text=E2%80%9CAs%20the%20first%20African%20nations,of%20Communications%20and%20Digital%20Economy.>

<sup>191</sup> Rorisang Moyo, *Algeria and Italy Sign Space Cooperation Agreement*, SPACE IN AFRICA (Jan. 24, 2023), <https://africanews.space/algeria-and-italy-sign-space-cooperation-agreement/>.

As mentioned before, private companies are also engaging in outer space activities in Africa. SpaceX received two licenses from Nigeria and Mozambique to provide them internet services for a period of ten years. However, the affordability of those services has been questioned.<sup>192</sup> Similarly, OneWeb announced a partnership agreement with Airtel Africa to provide connectivity services. This partnership builds on existing initiatives in Angola, South Africa, Ghana, Senegal, and Mauritius, where the companies are investing in internet penetration to support businesses and governments.<sup>193</sup>

Undeniably, achieving a fully-fledged African-led cooperation in the continent will be arduous, firstly because of the geographical distance among spacefaring countries, secondly because of their limited resources,<sup>194</sup> and thirdly because of the historical and current reliance of foreign actors in developing space programs, which, considering the dual use of space technologies, represents a limit to these countries' national defense policies.

Notwithstanding the difficulties, cooperation efforts are proceeding and rightly so. In light of the growing importance of the domain, the role of regional partnership has become paramount to achieve and enhance peaceful uses of outer space and best practices, particularly considering that a stronger reliance on outer space might eventually lead to the security dilemma already faced by the most advanced spacefaring nations.

## VI. SPACE AND DEFENSE IN EUROPE

The European approach to outer space unfolds as a governance triangle where the main actors are the European Space Agency (ESA), the European Union and European Member States.

Europe is home to the largest number of advanced spacefaring nations, and notwithstanding the apparent fragmented approach to the domain, "boasts the world's most successful example of regional

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<sup>192</sup> Mustapha Iderawumi, *SpaceX's Starlink Approved by Nigeria and Mozambique*, SPACE IN AFRICA (May 27, 2022), <https://africanews.space/spacexs-starlink-approved-by-nigeria-and-mozambique/>.

<sup>193</sup> Deborah Faboade, *OneWeb and Airtel Africa Collaborate to Provide Enhanced Connectivity Services in Africa*, SPACE IN AFRICA (Nov. 9, 2022), <https://africanews.space/onetweb-and-airtel-africa-collaborate-to-provide-enhanced-connectivity-services-in-africa/>.

<sup>194</sup> Adetola, *supra* note 165.

space cooperation.”<sup>195</sup> As a consequence, the European space industry is one of the most sophisticated in the world.

The need to foster space cooperation emerged during the Cold War and led to the establishment of the European Launcher Development Organisation (ELDO) and the European Space Research Organisation (ESRO) in the 1960s, which merged into ESA in 1975.<sup>196</sup>

The purpose of ESA, as provided for in its establishing convention, is to advance peaceful cooperation among European nations by elaborating and implementing space policies and activities, as well as coordinating and harmonizing Member States space programs.<sup>197</sup>

The European Union has been an active player in outer space since the end of the twentieth century and the 2004 EC-ESA cooperation agreement<sup>198</sup> can be regarded as the *momentum* of European involvement in space activities. From that moment onwards, the EU and ESA deepened their relations, developing valuable space projects which benefitted European citizens while reinforcing regional integration.<sup>199</sup>

The legal framework regulating space can be found in the Treaty on the Functioning of the European Union (TFEU), which entrusts the EU with the competence of carrying out activities “to define and implement [space] programmes”.<sup>200</sup> However, the right of the EU to exercise this competence “shall not result in Member States being prevented from exercising theirs,”<sup>201</sup> meaning that outer space is a shared competence between Member States and the Union. Further, Article 189 of the TFEU provides for the possibility

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<sup>195</sup> Zhao, *supra* note 143, at 250.

<sup>196</sup> Meriem Behiri, Giuseppe Galeandro, Jacopo Maschini, Jahjdaniele Tonti, & Eleonora Vestito, *La Competizione Nello Spazio: Dalla Cooperazione Internazionale Diffusa Alla Cooperazione Selettiva. Quali Modelli Di Sostenibilità?*, (2021) Quaderno 21, La Comunità Internazionale 1. See also Zhao, *supra* note 143.

<sup>197</sup> UNITED NATIONS TREATY SERIES, CONVENTION FOR THE ESTABLISHMENT OF A EUROPEAN SPACE AGENCY (1975), <https://treaties.un.org/doc/publication/UNTS/Volume%201297/v1297.pdf>.

<sup>198</sup> Framework Agreement between the European Community and the European Space Agency, L 261/68 (Aug. 6, 2004) <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:261:0064:0068:EN:PDF>

<sup>199</sup> Behiri, *supra* note 196.

<sup>200</sup> Consolidated Version of the Treaty on the Functioning of the European Union at art. 4, Oct. 26, 2012, 2012 O.J. (C 326) [hereinafter TFEU]

<sup>201</sup> *Id.*

of establishing a European space policy in order to, *inter alia*, promote technical and scientific progress.<sup>202</sup> Beside the implementation of space policies, scientific and technical progress can be achieved through joint initiatives, coordinated efforts and ordinary legislative procedures. Nonetheless, Article 189 is clear in stating that every effort aimed at enhancing cooperation cannot result in the harmonization of space laws and regulations of Member States.<sup>203</sup> This provision is extremely important as it entails that, unless Member States autonomously decide to coordinate their space policies or to amend the TFEU, the European approach to outer space suffers a high risk of fragmentation.

In a way, this structural governance issue has already been solved, as Member States heavily rely on European projects and infrastructures for their space activities and are thus likely to cooperate in supporting EU-ESA's programs. This is particularly true considering that European Member States alone would not be able to compete at the international level.

To this end, programs established in cooperation with ESA become a fundamental tool for the European Union Space Sector. Among them, COPERNICUS was developed *inter alia* for security applications and to provide precise information regarding environmental protection. It is the most advanced electro-optical system, able to generate, detect, and measure radiation in the optical spectrum.<sup>204</sup> Other relevant programs include EGNOS, GALILEO and GOVSATCOM. EGNOS is the European regional satellite-based augmentation system (SBAS), which uses existing Global Navigation Satellite Systems (GNSSs) and improves their performance.<sup>205</sup>

To ensure Europe's independence from the American Global Positioning System (GPS) and the Russian GLONASS and to create a GNSS which could better respond to civilian applications, the European Commission and ESA developed GALILEO, the European

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<sup>202</sup> TFEU, *supra* note 200, at art. 189.

<sup>203</sup> *Id.*

<sup>204</sup> Technology Editor, *Electro-Optical Systems for Drones and UAV*, UNMANNED SYS. TECH., <https://www.unmannedsystemstechnology.com/expo/electro-optical-systems/> (last updated Oct. 20, 2023).

<sup>205</sup> EGNOS, EUR. SPACE AGENCY (Nov. 23, 2000), [https://www.esa.int/Space\\_in\\_Member\\_States/Italy/EGNOS](https://www.esa.int/Space_in_Member_States/Italy/EGNOS); *See also Galileo and EGNOS*, EUR. SPACE AGENCY, [https://www.esa.int/Applications/Navigation/Galileo\\_and\\_EGNOS](https://www.esa.int/Applications/Navigation/Galileo_and_EGNOS) (last visited July 30, 2023).

GNSS, to provide free and open access to position and navigation services.<sup>206</sup> So far, GALILEO comprises twenty-six satellites and is the “world’s single most accurate satellite navigation system, serving more than 1.5 billion smartphones and devices.”<sup>207</sup>

In addition, the Global Strategy for the European Union’s Foreign and Security Policy, approved in 2016, established the European Union Governmental Satellite Communications program, GOVSATCOM. The project will develop secure communications for European public agencies and institutions, contributing to the EU threat-tackling capabilities. The need for a secure communication system derives from the wish to detach commercial satellite infrastructures from governmental ones at the European level, in order to enhance the EU’s governmental actors’ ability to respond to crises.<sup>208</sup>

The European Union has been heavily investing in space programs with the aim of maintaining its role as a space power and the EU’s governance structure in space highlights the cross-cutting nature of the domain’s. For instance, the Director-General for Defence Industry and Space (DG DEFIS) was created as one of the operational bodies of the European Commission (EC).<sup>209</sup>

DEFIS is tasked with encouraging innovation in the European Defence industry and carrying out EU Space programs —namely, Copernicus, GALILEO and EGNOS.<sup>210</sup> Undoubtedly, the proximity of defense and space in the EC approach demonstrates the growing importance of the space-defense dichotomy at the European level.

As the only democratically elected body within the EU, the European Parliament (EP) “gives the EU space policy-making process a democratic footprint.”<sup>211</sup> The EP has a crucial role in supporting

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<sup>206</sup> Giancarlo La Rocca, *The European Way to Space: What Strategic Evolution?, in THE EXPANDING NEXUS BETWEEN SPACE AND DEFENCE* 50, 51 (Alessandro Marrone & Michele Nones eds., 2022).

<sup>207</sup> *This Is ESA*, EUR. SPACE AGENCY, [https://esamultimedia.esa.int/docs/corporate/This\\_is\\_ESA\\_EN\\_LR.pdf](https://esamultimedia.esa.int/docs/corporate/This_is_ESA_EN_LR.pdf) (last visited July 30, 2023).

<sup>208</sup> *GOVSATCOM*, EUR. UNION SPACE AGENCY, <https://www.euspa.europa.eu/european-space/govsatcom> (last visited July 30, 2023).

<sup>209</sup> La Rocca, *supra* note 206, at 52.

<sup>210</sup> *Director General Defence Industry and Space*, EUR. COMM’N, [https://commission.europa.eu/about-european-commission/departments-and-executive-agencies/defence-industry-and-space\\_en](https://commission.europa.eu/about-european-commission/departments-and-executive-agencies/defence-industry-and-space_en) (last visited July 30, 2023).

<sup>211</sup> *The Role of the 2019-2024 European Parliament in the European Space Sector, Executive Brief No.32*, EUR. SPACE POLY INST. (June 7, 2019), <https://>



the development of the *European Space Programme*—jointly with the Council, as provided for by Article 189 of TFUE—and overseeing the EC’s activities. Indeed, the EP strongly contributed to the creation of the European Union Agency for the Space Programme (EUSPA).<sup>212</sup>

Due to the importance of the space domain, the European External Action Service (EEAS) and the European Defense Agency (EDA) have become crucial stakeholders in the regional landscape. The 2011 EDA-ESA Administrative Arrangement testified the EU’s intention to foster the interrelation of space and defense; and, to that end, the agreement established a structured partnership aimed at coordinating the agencies’ respective activities while supporting the European space industrial segment<sup>213</sup>.

The interdisciplinary nature of outer space was further demonstrated during the COVID-19 emergency, when satellite technology supported crisis management efforts and security measures. At the same time, because of the crucial role played by space there is a pressing need to protect space objects from threats and natural hazards.<sup>214</sup> This realization is manifested by the approval of Regulation 2021/696 and Decision 2021/698. The former created EUSPA and established the *European Union Space Programme*<sup>215</sup>, while the latter acknowledged the possibility of responding to attacks and threats to EU space infrastructures.<sup>216</sup>

EUSPA represents an important step in establishing a fully-fledged European space policy. Indeed, it aims at enforcing and overseeing the security of the EU Space Program to benefit the European Union and its Member States, and at the same time at

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/www.espi.or.at/briefs/the-role-of-the-2019-2024-european-parliament-in-the-european-space-sector/ (last visited July 30, 2023).

<sup>212</sup> *Id.*

<sup>213</sup> Administrative Arrangement between the European Defence Agency and the European Space Agency Concerning the Establishment of their Cooperation (June 2011) <https://eda.europa.eu/docs/default-source/documents/documents/aa---eda---esa-20-06-11.pdf>

<sup>214</sup> La Rocca, *supra* note 206, at 50.

<sup>215</sup> Regulation (EU) 2021/696 of The European Parliament And Of The Council establishing the Union Space Programme and the European Union Agency for the Space Programme and repealing Regulations (EU) No 912/2010, (EU) No 1285/2013 and (EU) No 377/2014 and Decision No 541/2014/EU, (Apr. 28, 2021).

<sup>216</sup> Council Decision (CFSP) 2021/698 On The Security Of Systems And Services Deployed, Operated And Used Under The Union Space Programme Which May Affect The Security Of The Union, And Repealing Decision 2014/496/CFSP, (Apr. 30, 2021).

increasing the competitiveness of the European space industry.<sup>217</sup> EUSPA's activities will be carried out in conjunction with ESA. However, while EUSPA is a body representing the political will of the EU, ESA will focus on research and scientific space applications.<sup>218</sup> It has been argued that merging EUSPA and ESA could provide strategic advantages for the region as it would further strengthen its role as a global actor.<sup>219</sup> Although desirable in principle, such a considerable change must be approved by Council of ESA Member States and the Council of the European Union, and it seems unlikely that ESA's Members not part of the EU, namely the United Kingdom and Norway will endorse it.

In addition to the Regulation 2021/696 and Decision 2021/698, the European Commission adopted in 2021 the Action Plan on Synergies Between Civil, Defence and Space Industries to facilitate "civilian-space-defence cross-fertilisation."<sup>220</sup> The plan intends to foster dual use innovation, thus avoiding duplicating civilian technology for military and defense purposes so as to enhance European security and economic growth and strengthen the Single Market.<sup>221</sup>

Europe's increasing link between space and defense is further recognized in the 2022 Strategic Compass, a visionary plan whereby the European Union pledges to bolster the EU's security and defense policy by 2030.<sup>222</sup> The European Union will *inter alia* develop an EU Space Strategy for Security and Defense "in order to strengthen its ability to anticipate, deter and respond to current and fast-emerging threats and challenges, and safeguard the EU's

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<sup>217</sup> *About EUSPA*, EUR. UNION AGENCY FOR THE SPACE PROGRAMME, <https://www.euspa.europa.eu/about/about-euspa> (last visited July 30, 2023).

<sup>218</sup> Josely Moda, Maria Vittoria Prest, Eleonora Messina, Maria Enrica Ragone, Pietro Santoriello, & Alessandro Bonifazi, *Il Diritto Delle Attività Spaziali Tra Cooperazione E Competizione Per Lo Spazio*, (2021) Quaderno 21, La Comunità Internazionale 167.

<sup>219</sup> *Id.*

<sup>220</sup> *Action Plan on Synergies Between Civil, Defence and Space Industries*, EUR. COMM'N, [https://commission.europa.eu/system/files/2021-03/action\\_plan\\_on\\_synergies\\_en\\_1.pdf](https://commission.europa.eu/system/files/2021-03/action_plan_on_synergies_en_1.pdf) (last visited July 30, 2023).

<sup>221</sup> *Id.*

<sup>222</sup> *A Strategic Compass for a Stronger EU Security and Defence in the Next Decade*, COUNCIL OF THE EUR. UNION (Mar. 21, 2022), <https://www.consilium.europa.eu/en/press/press-releases/2022/03/21/a-strategic-compass-for-a-stronger-eu-security-and-defence-in-the-next-decade/> (last visited July 30, 2023). [hereinafter EU Strategic Compass].

security interest.”<sup>223</sup> This effort will be supplemented by the development of policies to support the *European Defence Technological and Industrial Base* and its crisis-management ability.<sup>224</sup>

Considering NATO’s Brussels Declaration and the new approach of the European Union, together with the general international environment of mistrust, it appears that outer space is turning into a more competitive domain. Among NATO and EU/ESA members, reorganizations of the space sector and its governance are taken place. These are accompanied by a change of perspectives towards investments in dual use space technologies and an increasing assertiveness when tackling international threats.

#### A. France and Germany

The evolution is evident in France, where the 2019 Space Defence Strategy increased the role played by national defense actors. Along this line, France established the Space Command (*Commandement de l’espace—CdE*) which will coordinate space-defense capabilities and will operate under the Air and Space Force. In addition, the French strategy advocates for an “active space defence,”<sup>225</sup> entailing that the country would be ready to respond to space threats by operating, *inter alia*, lasers and patrolling nanosatellites. This resolute approach comes as a response to the 2017 reported case of alleged espionage against the French-Italian Athena-Findus satellite.<sup>226</sup>

To additionally enhance its already expanding space-defense industry, France is planning on increasing the funds dedicated to satellite capabilities, particularly SSA.<sup>227</sup>

Moreover, following NATO’s recognition of outer space as an operational domain, the NATO Center for Excellence was established in Toulouse, further strengthening France’s pivotal role within the Alliance and as a global spacefaring nation.<sup>228</sup>

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<sup>223</sup> *Id.*

<sup>224</sup> *Id.*

<sup>225</sup> THE FRENCH MINISTRY FOR THE ARMED FORCES, SPACE DEFENCE STRATEGY 10 (2019), [https://www.gouvernement.fr/sites/default/files/locale/piece-jointe/2020/08/france\\_-\\_space\\_defence\\_strategy\\_2019.pdf](https://www.gouvernement.fr/sites/default/files/locale/piece-jointe/2020/08/france_-_space_defence_strategy_2019.pdf).

<sup>226</sup> Calcagno, *supra* note 126, at 41.

<sup>227</sup> SPACE DEFENCE STRATEGY, *supra* note 225.

<sup>228</sup> *Id.*

Conversely, Germany is pursuing a more cautious approach, as shown by 2010 German Space Strategy, where the importance of maintaining a civil approach to space applications was outlined.<sup>229</sup> Despite including outer space as a military operational domain, the 2016 White Paper on German Security Policy is centered on intensifying transparency and confidence-building measures,<sup>230</sup> factually overlooking the growing competitiveness of the domain.

Currently, German military affairs in space are overseen by the Air Force and the country's space programs, presenting a dual—military and civilian—approach that focuses on SSA and SATCOM. Moreover, the new Space Command was established in 2021, under the German Armed Force. The body was designed to comprise every aspect of the space domain under a single command<sup>231</sup> and fully reflects the reforms that have been taking place in spacefaring countries in the past years.

A change in Germany's peaceful approach is to be expected in the next years, considering both the growing militarization of outer space, and the important debates taking place in the country regarding the military support to Ukraine. Arguably, the war in Ukraine represents an important shift in international relations, as it augmented European and USA concerns about Russian aggressiveness and Russian-Chinese cooperation. Indeed, security in outer space is turning into a crucial issue in Europe, and Germany is now planning on deploying a missile warning system in space, previously possessed only by Russia and the US.<sup>232</sup>

### *B. The Increasing Role of Defense in Italy's Space Activities*

As a world-leading spacefaring country, second in Europe for number of objects in orbit and the third greatest contributor to

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<sup>229</sup> Federal Ministry of Economics and Technology (BMW), *Making Germany's space sector fit for the future, The space strategy of the German Federal Government* (Nov. 2010) <https://csps.aerospace.org/sites/default/files/2021-08/German%20space%20strategy%20Nov10.pdf>

<sup>230</sup> White Paper on German Security Policy And The Future of The Bundeswehr (June 2016) <https://www.bundeswehr.de/resource/blob/4800140/fe103a80d8576b2cd7a135a5a8a86dde/download-white-paper-2016-data.pdf>

<sup>231</sup> Calcagno, *supra* note 126, at 40.

<sup>232</sup> Tim Stickings, *Germany Could Build Missile Warning System in Space*, THE NATIONAL (Jan. 4, 2023) <https://www.thenationalnews.com/world/europe/2023/01/04/germany-could-build-missile-warning-system-in-space/> (last visited July 30, 2023).

ESA,<sup>233</sup> the increasing role of defense in Italy's space activities should not be overlooked. The country developed a holistic approach to the space sector, focusing on cooperation and space diplomacy in addition to space science and applications. Worth about 2 billion euros,<sup>234</sup> the space industry holds a fundamental role in Italy. Indeed, the country is second in Europe for investments in the sector as percentage of GDP,<sup>235</sup> and the industrial landscape includes more than 200 companies, covering the entire space supply chain.<sup>236</sup>

The Italian institutional framework for space governance was comprehensively reformed in 2018 with the law “11 gennaio 2018, n.7. *Misure per il coordinamento della politica spaziale e aerospaziale e disposizioni concernenti l'organizzazione e il funzionamento dell'Agenzia spaziale italiana.*”<sup>237</sup> Although not regulating the functioning of the space domain thoroughly, the law is a remarkable step in setting the foundations for an exhaustive and far-reaching approach to outer space, establishing the Inter-Ministerial Committee for Space Policies and Aerospace Research (*Comitato interministeriale per le politiche relative allo spazio e alla ricerca aerospaziale*—COMINT) chaired by President of the Council of Ministers, and vesting the President of the Council of Ministers with the responsibility of coordinating national space and aerospace policies.

In line with the reforms undertaken by Italy's partners, the Office of the Military Council (*Ufficio del consigliere militare*—

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<sup>233</sup> Giancarlo La Rocca & Alessandro Marrone, *Italy and Space, A Strong Position to Enhance*, in THE EXPANDING NEXUS BETWEEN SPACE AND DEFENCE 62, 62 (Alessandra Marrone & Michele Nones eds., 2022); See also *Funding*, EUR. SPACE AGENCY, [https://www.esa.int/About\\_Us/Corporate\\_news/Funding](https://www.esa.int/About_Us/Corporate_news/Funding) (last visited July 30, 2023).

<sup>234</sup> Alessandro Gili & Davide Fanciulli, *A Strategy for the EU and Italy in the Space*, ISPI (Dec. 10, 2020), <https://www.ispionline.it/en/publicazione/strategy-eu-and-italy-space-28632> (last visited July 30, 2023).

<sup>235</sup> Rocca & Marrone, *supra* note 233, at 70.

<sup>236</sup> *Italian Space Industry Online Catalogue*, IT. SPACE INDUS., <https://italianspaceindustry.it> (last visited July 30, 2023).

<sup>237</sup> Legge 11 gennaio 2018, n.7: *Misure per il coordinamento della politica spaziale e aerospaziale e disposizioni concernenti l'organizzazione e il funzionamento dell'Agenzia spaziale italiana* (18G00025), <https://www.gazzettaufficiale.it/eli/gu/2018/02/10/34/sg/pdf>.

UCM) role is now coordinating and supporting Italian space activities at a governmental level.<sup>238</sup>

Following the 2018 reform, the President of the Council of Ministers published the *Government Guidelines on Space and Aerospace*<sup>239</sup> and the *National Security Strategy for Space*,<sup>240</sup> in 2019. The Guidelines clarify Italy's priorities in outer space, so as to further nurture its position as a global space actor.<sup>241</sup> The *National Security Strategy for Space* recognizes the gaps of the existing international legislation and the need to address contemporary developments of the space domain.<sup>242</sup> Similarly, the Strategy stresses that the growing risks related to space competitiveness and congestion require reinforcing Italy's Space Situational Awareness and Space Surveillance Tracking.<sup>243</sup>

Moreover, the document underlines the need to protect national security and defense interests given the increasingly blurred line between the military and the civilian uses of outer space.<sup>244</sup> Hence, it emphasizes the importance of acquiring new capabilities to "prevent, deter and defend" space infrastructures from attacks, and develop norms with the objective of reinforcing the industrial sector in its military and civilian use.<sup>245</sup>

Due to the growing importance of the domain for national interests, on August 2, 2022, the Presidency of the Council of

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<sup>238</sup> Il Presidente del Consiglio dei Ministri, Articolo unico (Apr. 14, 2018) [https://presidenza.governo.it/AmministrazioneTrasparente/Organizzazione/ArticolazioneUffici/UfficiDirettaPresidente/UfficiDiretta\\_CONTE/COMINT/DPCM\\_20180414.pdf](https://presidenza.governo.it/AmministrazioneTrasparente/Organizzazione/ArticolazioneUffici/UfficiDirettaPresidente/UfficiDiretta_CONTE/COMINT/DPCM_20180414.pdf)

<sup>239</sup> Presidenza del Consiglio dei Ministri, *Indirizzi del Governo in materia spaziale e aerospaziale* (Mar. 25, 2019) [https://presidenza.governo.it/AmministrazioneTrasparente/Organizzazione/ArticolazioneUffici/UfficiDirettaPresidente/UfficiDiretta\\_CONTE/COMINT/DEL\\_20190325\\_aerospazio.pdf](https://presidenza.governo.it/AmministrazioneTrasparente/Organizzazione/ArticolazioneUffici/UfficiDirettaPresidente/UfficiDiretta_CONTE/COMINT/DEL_20190325_aerospazio.pdf) [hereinafter *Presidenza Indirizzi*].

<sup>240</sup> Presidency of the Council of Ministers, *National Security Strategy for Space* (2019) [https://presidenza.governo.it/AmministrazioneTrasparente/Organizzazione/ArticolazioneUffici/UfficiDirettaPresidente/UfficiDiretta\\_CONTE/COMINT/NationalSecurityStrategySpace.pdf](https://presidenza.governo.it/AmministrazioneTrasparente/Organizzazione/ArticolazioneUffici/UfficiDirettaPresidente/UfficiDiretta_CONTE/COMINT/NationalSecurityStrategySpace.pdf) [hereinafter *Presidenza Security Strategy*].

<sup>241</sup> *Presidenza Indirizzi*, *supra* note 239.

<sup>242</sup> *Presidenza Security Strategy*, *supra* note 240.

<sup>243</sup> *Id.*

<sup>244</sup> *Id.*

<sup>245</sup> *Id.*

Ministers established the Office of Space and Aerospace Policies as a body supporting the President in coordinating space policies.<sup>246</sup>

The dual character of outer space applications and their strategic relevance brought about a restructuring within the Ministry of Defense and the establishment of the General Space Office (*Ufficio Generale Spazio*—UGS) in 2019 and the Space Operations Command (*Comando Operazioni Spaziali*—COS) in 2020.<sup>247</sup> The former is tasked with international cooperation, space programs and space policies, factually developing the strategic horizon of space operations. The latter carries out such programs and space strategies. Under COS supervision, in 2021, the Joint Centre for Satellite Remote Sensing (*Centro Interforze di Telerilevamento Satellitare*—CITS) and the Joint SICRAL<sup>248</sup> Management and Control Centre (*Centro di Interforze di Gestione e Controllo SICRAL*—CIGC SICRAL) effectively re-orbited an obsolete satellite—SICRAL 1—from the Geostationary Orbit to a graveyard orbit, as to avoid creating risks to other operational satellites.<sup>249</sup> This was a remarkable operation for three reasons. Firstly, it represented the first re-orbiting mission undertaken by the Ministry of Defence,<sup>250</sup> demonstrating the effectiveness of the military reorganization. Secondly, the operation confirmed Italy's outstanding capabilities in outer space. Thirdly, it proved Italy's commitment to avoiding outer space congestion.

Undoubtedly, the reorganization of the Ministry of Defence portrays an attempt to augment the relation between space and defense and reflects the recognition of outer space as an operational domain within NATO and its partners. This attitude was echoed in the 2021-2023 Defence Multiannual Programmatic Document where Italy pledged to ensure the surveillance and defense of its

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<sup>246</sup> Decreto del Presidente del Consiglio dei Ministri, art. 1, July 15, 2022, <https://presidenza.governo.it/AmministrazioneTrasparente/DisposizioniGenerali/AttiGenerali/DpcmOrganizzazione/DPCM%2012%20luglio%202022.pdf>.

<sup>247</sup> Rocca & Marrone, *supra* note 233, at 66.

<sup>248</sup> *Sistema Italiano per Comunicazioni Riservate ad Allarmi* – SICRAL is the Italian system of early warning communications. Similarly, SICRAL satellites support armed forces in tackling natural disasters. See *Spazio: conclusa con successo la prima operazione di re-orbiting satellitare*, MINISTERO DELLA DIFESA, (May 12, 2021), [https://www.difesa.it/Primo\\_Piano/Pagine/spazio-conclusa-con-successo-la-prima-operazione-di-re-orbiting-satellitare.aspx](https://www.difesa.it/Primo_Piano/Pagine/spazio-conclusa-con-successo-la-prima-operazione-di-re-orbiting-satellitare.aspx).

<sup>249</sup> *Id.*

<sup>250</sup> *Id.*

airspace while contributing to the Euro-Atlantic defense efforts and the respect of international law.<sup>251</sup> However, Italy still lacks a comprehensive investment plan that could practically support the increasing importance of the military sector in space-related matters.

The country's overarching strategic interests in outer space can be successfully safeguarded only through the enhancement of bilateral and multilateral relations.

In the European Union, France is one of Italy's most relevant partners. Their collaboration was further consolidated by the Treaty between the Italian Republic and the French Republic for a Stronger Bilateral Cooperation,<sup>252</sup> which specifically addresses outer space cooperation, regarded as a key European strategic area of development, in Article 7. Thus, the Parties commit to harmonizing their space strategies and peaceful exploration activities and to enhancing bilateral partnership in the industrial, scientific, and technological sectors.<sup>253</sup>

Another successful example of space diplomacy is the signature of the US-led Artemis Accords in 2020 and the decision to join the Artemis Programs<sup>254</sup>. The US-Italy cooperation efforts are also manifested in the 2022 Dart Mission, a joint endeavor to which ASI participated by providing NASA with LiciaCube, a nanosatellite created to share real time images. ASI-NASA partnership enabled the orbital change of an asteroid and constituted the first planetary defense mission.<sup>255</sup>

Italy perceives Space diplomacy as a means to increase space safety. For instance, the 2017 statement delivered to the UN First Committee by the Italian Ambassador Vinicio Mati underlined Italy's intention to support the implementation of Transparency and

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<sup>251</sup> Documento programmatico pluriennale per la Difesa per il triennio 2021-2023 – Doc. CCXXXIV, n. 4, Sept. 14, 2021.

<sup>252</sup> Quirinal Treaty, *Trattato tra la Repubblica Italiana e la Repubblica Francese per una Cooperazione Bilaterale Rafforzata*, (Nov. 26, 2021).

<sup>253</sup> *Id.* at art. 7.

<sup>254</sup> *Artemis, siglato il primo accordo multilaterale di cooperazione internazionale*, AGENZIA SPAZIALE ITALIANA (Oct. 13, 2020), <https://www.asi.it/2020/10/artemis-siglato-il-primo-accordo-multilaterale-di-cooperazione-internazionale/>.

<sup>255</sup> Marco Battaglia, *Difesa planetaria. Dart è un successo grazie all'Italia*, LE FORMICHE (Oct. 12, 2022) <https://formiche.net/2022/10/difesa-planetaria-dart-e-un-successo-grazie-allitalia/>.



Confidence Building Measures.<sup>256</sup> Further, considering the country's role as one of the major proponents of the EU draft International Code of Conduct, Ambassador Vinicio Mati remarked Italy's commitment to responsible space behaviors.<sup>257</sup> Ambassador Gianfranco Incarnato, Italian Permanent Representative to the CD, reiterated this position in 2018, emphasizing the Italian pledge to PAROS and to preventing outer space from becoming an area of conflict.<sup>258</sup>

## VII. CONCLUSIONS

Space law suffers from the unclearness of its terminology. In the past, the lack of clear boundaries and precise definitions represented only a marginal issue. However, today the emergence of new actors, both public and private, could lead to different and conflicting interpretations of the vague language adopted in the legal framework regulating space activities. This is particularly evident with regard to the outer space confine and its definite extent. Indeed, air law and space law operate on distinct and divergent sovereignty and liability principles. The boundary between air and space is a gray area where several activities could take place but where no clear legal regime applies. Thus, the increasing technological capabilities and number of actors involved in space activities warrants a clearer legislation to guarantee certainty and predictability.

Since the launch of the first object into orbit, the international community has stressed the importance of using outer space for peaceful purposes. This principle, enshrined in the Outer Space Treaty and reiterated in every UN Treaty and Resolution, represents the *opinio iuris* which has guided the actions of spacefaring

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<sup>256</sup> PERMANENT MISSION OF ITALY TO THE UNITED NATIONS, STATEMENT BY H.E. AMBASSADOR VINICIO MATI, PERMANENT REPRESENTATIVE OF ITALY TO THE CONFERENCE ON DISARMAMENT TO THE FIRST COMMITTEE OF THE 72<sup>ND</sup> UN GENERAL ASSEMBLY OUTER SPACE (2017), <https://www.un.org/disarmament/wp-content/uploads/2018/11/statement-by-italy-72-os.pdf>.

<sup>257</sup> *Id.*

<sup>258</sup> PERMANENT MISSION OF ITALY TO THE UNITED NATIONS, STATEMENT BY H.E. AMBASSADOR GIANFRANCO INCARNATO, PERMANENT REPRESENTATIVE OF ITALY TO THE CONFERENCE ON DISARMAMENT TO THE FIRST COMMITTEE OF THE 73<sup>RD</sup> UN GENERAL ASSEMBLY (2018), <https://www.un.org/disarmament/wp-content/uploads/2018/10/statement-by-italy.pdf>.

nations. In this regard, outer space activities have historically been characterized by an ethic founded on peaceful cooperation and mutual understanding, in a fashion contrary to other domains on Earth. Notwithstanding its importance, there exists no definition of *peaceful use*, and the term *peaceful* has been interpreted as *non-aggressive*, meaning that military activities in orbit would conform with international law. However, the extent of these military activities is yet to be clearly defined, effectively generating additional legal grey areas.

Despite the need for regulatory efforts to tackle the increasingly urgent issue of the weaponization of space, so far, the international community has not been able to find feasible solutions to the matter. The PPWT represented an effort to regulate the space arms race. Beside banning aggressions in outer space, the draft Treaty provided States with the possibility of resorting to the use of force in case of self-defense under Article 51 of the UN Charter, a possibility which no international space law treaty had ever given to its signatory States as it suggests the prospect of an armed conflict in space. The ASAT tests that have been taking place in the last fifteen years demonstrate a contrasting attitude: while officially calling for PAROS, States are reluctant to renounce the development and deployment of offensive military capabilities, strengthening the national interdependence of space and defense. Arguably, this apparently ambivalent behavior is to be expected considering the growing worries and exacerbating mistrust among an increasingly large number of actors. Indeed, outer space is now perceived as a congested and competitive domain, where ensuring “space dominance” and “space power” is paramount. These terms carry a particularly strong stance and risk jeopardizing the peaceful and cooperative ethic on which space law supposedly rests.

In the past ten years, the most advanced spacefaring countries have created Space Forces as separate branches of their militaries, factually increasing the importance of the military in the outer space domain. By analyzing different national and international approaches to outer space, this attitude change is apparent. NATO has recognized the possibility of triggering the collective self-defense clause enshrined in Article V of the NATO Treaty in cases of attacks to Allied space objects. However, the lack of definition of what constitutes an armed attack capable of triggering this clause

creates substantial room for interpretation and a case-by-case approach. Some NATO Allies have embraced this view: for instance, France has adopted the doctrine of “active space defense” in cases of aggressive actions towards its space objects. Likewise, Italy has comprehensively reformed its space legal framework, strengthening the role of national defense actors and acknowledging—through the Italian National Space Strategy—the importance of preventing and deterring attacks in defense of allied space objects.

This change of posture is not only visible at the national level, but also at the supranational one. Indeed, the link between space and defense in the EU is growing stronger, as demonstrated by the intention to enhance synergies between the civil and military space sectors and the acknowledgment of the possibility of responding to threats and attacks to EU space infrastructures.

It is arduous to fathom and foresee the future direction of space law. The current trends display a progressive disengagement of the international community towards legally binding norms and a stronger involvement of the military sector. Indeed, the current scenario does not seem to be paving the way for resolute cooperative efforts in enhancing space law principles. However, history has demonstrated that even in times of outstanding conflicts and mistrust, the international community was able to find common grounds and avoid escalations. Hopefully, subsequent developments do not thwart the efforts made thus far in building a peaceful and cooperative future for space law.

# PROTECTING INTELLECTUAL PROPERTY IN OUTER SPACE: CHALLENGES AND SOLUTIONS

*Clark W. Lackert\* and Caleb Dorris\*\**

## I. INTRODUCTION

The commercialization of outer space in the 2020s is one of the largest seismic shifts in human history, as we venture away from Earth and travel throughout the solar system. Yet, outer space today is still a legal vacuum governed mostly by several 20th century treaties which do not focus on the needs of the 21st century. The upcoming exploration and commercialization of outer space will lead to the building of hotels, shopping centers, laboratories, universities, homes, and necessary related goods and services as we “recreate” human life off-planet. With these developments, we will need a legal infrastructure for space, not to “over-regulate” or

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*The opinions expressed by the authors are personal and do not represent any employer, group, or institution. This article has its basis in an article written by Clark Lackert in 2021, entitled Trademarks in Outer Space: Supporting the Off-world Economy, which can be found here: [https://www.wipo.int/wipo\\_magazine/en/2021/04/article\\_0005.html](https://www.wipo.int/wipo_magazine/en/2021/04/article_0005.html).*

“colonize” it, but to create a safe environment for its new population and a solid basis for both national and private investment.

One legal segment which has been neglected in space is intellectual property (IP) which protects patents (inventions), trademarks (commercial symbols and indications of origin) and copyrights (creative expressions such as art, music, literature, and software). Although this subject has been debated for decades in the United Nations and the World Intellectual Property Organization (WIPO), nothing major has been done to create a legal framework for IP in space. Multiple countries are currently traveling in outer space,<sup>1</sup> and Earth-orbit hotels, as well as Moon and Mars cities are being planned.<sup>2</sup> The IP legal structure needs to be implemented *now* to avoid chaos off-world. This brief review will set forth the current legal situation, as well as principles and parameters for a working model of IP law in outer space. These principles which use trademarks as an example can be used for patents, copyrights, and other intellectual property as well, keeping in mind the differences between “creating” rights off-world and “enforcing” these rights (which can be quite different).

## II. THE CURRENT STATE OF AFFAIRS

At the height of the Cold War in the 1950s and 1960s, the originators of space travel, the Soviet Union and the United States were engaged in a two-way “Space Race.” Now China, the European Space Agency (ESA), India, Israel, Japan and many others have hearty space programs.<sup>3</sup> New space programs are being developed in countries such as Malaysia, Egypt, Indonesia, Pakistan, South Korea, North Korea, Iran and Saudi Arabia.<sup>4</sup> Moreover, the era of private sector space flights has begun. Virgin Galactic launched the

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<sup>1</sup> Avery Koop, *Visualized: Which Countries are Dominating Space?*, VISUAL CAPITALIST (July 8, 2022), <https://www.visualcapitalist.com/visualized-which-countries-are-dominating-space/>.

<sup>2</sup> Caroline Delbert, *See the Astonishing Plans for the Very First City on Mars*, POPULAR MECHANICS (Mar. 24, 2021), <https://www.popularmechanics.com/science/a35915975/mars-city-nuwa-plans/>.

<sup>3</sup> *Countries with Space Programs 2023*, WORLDPOPULATIONREVIEW.COM (Jan. 1, 2023), <https://worldpopulationreview.com/country-rankings/countries-with-space-programs>.

<sup>4</sup> *Id.*

first commercial flight to the edge of space.<sup>5</sup> Private companies from countries ranging from the United States to India to the United Arab Emirates and even China are now looking to outer space as the next area of commercial development eyeing new industries like asteroid mining.<sup>6</sup> These developments go hand-in-hand with other major disrupter technologies including artificial intelligence and the metaverse.

The number of satellites in space has exploded in recent years. Between 2000 and 2021, the number of active satellites in orbit has increased more than five-fold from 769 to approximately 5,000.<sup>7</sup> Additionally, from 2020 to 2021 alone, the total number of satellites in orbit increased by almost 30 percent.<sup>8</sup> Perhaps most relevant in the near term, with the completion of China's Tiangong Space Station, the International Space Station now has a companion for the first time since Mir was decommissioned in 2001.<sup>9</sup> Where in past films we have been shown glimpses of trademarks in space, including PAN AMERICAN (PAN AM) and HOWARD JOHNSON'S in "2001: A Space Odyssey" (1968) or HILTON or MARS TODAY (a play on USA TODAY) in "Total Recall" (1990), the very near future promises a flood of off-world trademarks as well as space-based inventions and software patents. For example, Merck has is partnering with Varda Space Industries to create pharmaceuticals in space.<sup>10</sup> Moreover, Rolls-Royce plans to build a nuclear reactor on the Moon,

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<sup>5</sup> Michael Sheetz, *Virgin Galactic Completes First Commercial Flight in Major Step for Space Tourism Company*, CNBC (June 29, 2023), <https://www.cnbc.com/2023/06/29/virgin-galactic-first-commercial-spaceflight-live-stream-updates.html>.

<sup>6</sup> Robert Lea, *What's Next for India's Chandrayaan-3 Moon Rover Mission?*, SPACE.COM (July 14, 2023), <https://www.space.com/india-chandrayaan-3-moon-mission-next-steps>.

<sup>7</sup> Erick Burgueno Salas, *Number of Active Satellites from 1957 to 2021*, STATISTA (Feb. 10, 2022), <https://www.statista.com/statistics/897719/number-of-active-satellites-by-year/#:~:text=In%202021%2C%20there%20was%20an,3%2C291%20active%20satellites%20in%202020>.

<sup>8</sup> Nibedita Mohanta, *How Many Satellites are Orbiting the Earth in 2021?*, GEOSPATIALWORLD.NET (May 28, 2021), <https://www.geospatialworld.net/blogs/how-many-satellites-are-orbiting-the-earth-in-2021/>.

<sup>9</sup> Ramin Skibba, *China Is Now a Major Space Power*, WIRED (Nov. 4, 2022), <https://www.wired.com/story/china-is-now-a-major-space-power-tiangong-space-station/>.

<sup>10</sup> Jackie Wattles, *Forget Space Tourism. This Company Wants to Make Drug Manufacturing the Next Big Extraterrestrial Business*, CNN (June 12, 2023), <https://www.cnn.com/2023/06/12/business/spacex-launch-var-da-drug-pharma-space-industry-scen/index.html>.

presumably with patent processes and trade secrets which will need protecting.<sup>11</sup>

### III. EXISTING INTERNATIONAL APPROACHES TO OUTER SPACE GENERALLY

In outer space, physical property has been regulated under various international conventions, intergovernmental organizations, bilateral and multilateral agreements, international principles and customary law.<sup>12</sup> Furthermore, several types of soft law such as United Nations (UN) General Assembly Resolutions, international commission initiatives and studies by non-governmental bodies provide States with basic guidelines to aid them in their approach to regulating physical property in space.<sup>13</sup> However, despite the numerous bodies of law seeking to regulate physical property in space, there is no international consensus or understanding regarding the regulation of intangible property, such as intellectual property, in outer space.<sup>14</sup> Given the rapid increase in patent and copyright claims to inventions or software created on the International Space Station, it is highly likely that in the near future more attention will be given to intellectual property rights in outer space.<sup>15</sup>

The latest analysis of IP law in space has emphasized a possible contradiction between the concept of proprietary rights in outer space activities and the fundamentals of existing international agreements, such as the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (OST), which promote the exploration and use of outer space for “the benefit and in the interests

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<sup>11</sup> Josh Dinner, *Rolls-Royce Gets Funding to Develop Miniature Nuclear Reactor for Moon Base*, SPACE.COM (Mar. 19, 2023), <https://www.space.com/rolls-royce-funding-microreactor-moon-base>.

<sup>12</sup> See Comm. on the Peaceful Uses of Outer Space, Rep. of the Comm. on Its Sixty-Second Session, Annex II, ¶ 5, UN Doc A/74/20 (2019).

<sup>13</sup> *Id.*

<sup>14</sup> See The International Space Station Intergovernmental Agreement, Jan. 29, 1998, T.I.A.S. 12927, [hereinafter Intergovernmental Agreement].

<sup>15</sup> Bruce Sterling, *Intellectual Property on the International Space Station*, WIRED (Sept. 26, 2009), <https://www.wired.com/2009/09/intellectual-property-on-the-international-space-station/>.

of all countries” as the “province of all [hu]mankind.”<sup>16</sup> Even accepting these principles, this does not mean that outer space will be a lawless free-for-all, since a sound legal system *will* be for the benefit of all humankind. Moreover, times have changed dramatically since the 1960s, with increased governmental activities and private initiatives indicating that issues of ownership in domains such as intellectual property are becoming more important than ever before.<sup>17</sup> Whatever happens, it is highly unlikely that human intellectual property activity in outer space will be an anarchic system where piracy runs rampant and IP owners and governments are powerless to stop the chaos.

Recent history shows that some international attention has been dedicated to intellectual property issues in outer space and that such reactions have been a response to increases in private investments for potential recreational activities.<sup>18</sup> As an example, the UN issued a formal declaration in 1997 delineating the need for outer space contractual agreements to recognize intellectual property rights.<sup>19</sup> A later UN workshop in 2004 proposed the inclusion of intellectual property issues as a topic for exploration by a dedicated legal subcommittee, but this failed to gain the votes necessary to proceed.<sup>20</sup> A continuing body at the UN, the Office for Outer Space Affairs (UNOOSA), acts as the Secretariat for the UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS), which may also be a platform to consider IP rights in outer space.<sup>21</sup>

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<sup>16</sup> Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 UST. 2410, 610 UNT.S. 205 [hereinafter Outer Space Treaty].

<sup>17</sup> *Intellectual Property and Space Activities*, WORLD INTEL. PROP. ORG. (WIPO) (Apr. 30, 2004), [https://www.wipo.int/export/sites/www/patent-law/en/developments/pdf/ip\\_space.pdf](https://www.wipo.int/export/sites/www/patent-law/en/developments/pdf/ip_space.pdf).

<sup>18</sup> See *The Artemis Accords: Principles for Cooperation in the Civil Exploration and Use of the Moon, Mars, Comets, and Asteroids*, NASA, Sect. 2(1)(b), <https://www.nasa.gov/wp-content/uploads/2022/11/Artemis-Accords-signed-13Oct2020.pdf>.

<sup>19</sup> *Meeting of Consultants on Inventions Made or Used in Outer Space*, WORLD INT'L PROPERTY ORG. (Mar. 7, 1997), [https://www.wipo.int/export/sites/www/patent-law/en/developments/pdf/inventions\\_space.pdf](https://www.wipo.int/export/sites/www/patent-law/en/developments/pdf/inventions_space.pdf).

<sup>20</sup> *Intellectual Property and Space Activities*, WORLD INT'L PROPERTY ORG. (Apr. 1, 2004), [https://www.wipo.int/export/sites/www/patent-law/en/developments/pdf/ip\\_space.pdf](https://www.wipo.int/export/sites/www/patent-law/en/developments/pdf/ip_space.pdf).

<sup>21</sup> *United Nations Office for Outer Space Affairs*, UNOOSA.ORG (July 1, 2023), <https://www.unoosa.org/> (last visited Dec. 20, 2023).



Likely in response to continued interest in private and commercial activities in outer space, the legal subcommittee of the UNCOPOUS discussed the potential creation of a third suborbital territory to complement the existing demarcation between Earth's sky and outer space.<sup>22</sup> This potential new territory could assist with governing activities, and intellectual property-related assets, connected with suborbital space tourism and "zero gravity" flights.<sup>23</sup>

Nevertheless, the concept of a third suborbital territory is in its infancy, and there remains no internationally recognized demarcation line between Earth and outer space. A decent unofficial proxy for the airspace/outer space divide is the "Kármán Line," specifically a demarcation set at 100 kilometers (62 miles) above the Earth's mean sea level.<sup>24</sup> However, the global community remains divided on whether there should be a demarcating line between airspace and outer space at all, and if so, where it should be located. For example, the US has consistently refused to recognize any such borders, and in 1990 extended its legislation to govern certain outer space invention activities as activities that take place within the US with the Patents in Space Act.<sup>25</sup>

#### A. UN: 1967 Outer Space Treaty

The OST, which entered into force in 1967, is the first such agreement to address the exploration and research activities of independent States in outer space.<sup>26</sup> Its objective is to ensure that such activities be pursued "for the benefit and in the interests of all countries" and to establish outer space as "the province of all [hu]mankind."<sup>27</sup> This collective and aspirational spirit is shared by later treaties concerning outer space, and, as such, parameters or

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<sup>22</sup> Space Safety L. & Regul. Comm. of the Int'l Ass'n. for the Advancement of Space Safety, *The Definition and Delimitation of Outer Space: Legal and Policy Considerations*, U.N. Doc. A/AC.105/C.2/2018/CRP.9 (2018).

<sup>23</sup> Legal Subcomm. of the Comm. On the Peaceful Uses of Outer Space, Definition and Delimitation of Outer Space, Additional Contributions Received from States Members of the Committee, U.N. Doc. A/AC.105/C.2/2022/CRP.24 (2022).

<sup>24</sup> Daisy Dobrijevic, *The Kármán Line: Where Does Space Begin?*, SPACE.COM (Nov. 14, 2022), <https://www.space.com/karman-line-where-does-space-begin>.

<sup>25</sup> Patents in Space Act of 1990 § 2, 35 USC. § 105.

<sup>26</sup> See Outer Space Treaty, *supra* note 16.

<sup>27</sup> *Id.* at art. I.

guidelines for property ownership and territorial governance have been absent from such agreements.

Although the OST specifies that outer space is not subject to national appropriation by a claim of sovereignty, by use, occupation, or by any other means,<sup>28</sup> it nevertheless includes certain provisions that could assist in managing future trademark ownership claims, including:

- Activities of nongovernmental entities in outer space shall require authorization and continuing supervision by an appropriate State party to the treaty.<sup>29</sup>
- While present in outer space, objects shall remain under the jurisdiction of their registry State, and any personnel of such objects shall also be under that same jurisdiction.<sup>30</sup> The registry State is typically the location of the object's launch or the State that procures the launching, otherwise known as the "Launching State."<sup>31</sup>
- All participating nations retain the right to access stations, installations, equipment, and space vehicles based on reciprocity, a clause that signals an intention of the UN to encourage free exchange and movement.<sup>32</sup>
- Mechanisms for addressing future conflicts arising from activities carried on by international governmental organizations in their exploration and use of outer space, specifically an allowance that States parties to the Treaty should resolve such questions by either engaging the international organization directly or electing to engage one or more State members of that international organization.<sup>33</sup>

It could be a simple transition to apply several of these principles to IP. For example, the fact that objects in space remain under

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<sup>28</sup> *Id.* at art. II.

<sup>29</sup> *Id.* at art. VI.

<sup>30</sup> *Id.* at art. VIII.

<sup>31</sup> Convention on International Liability for Damage Caused by Space Objects, Sept. 1, 1972, 24 UST. 2389, 961 UNT.S. 187 [hereinafter Liability Convention].

<sup>32</sup> See Outer Space Treaty, *supra* note 16, at art. XII.

<sup>33</sup> *Id.* at art. VI.

the jurisdiction of their registry State could be used to justify extending intellectual property rights to an object if it is registered under a State. Such space objects could be registered under the local laws of the States they are registered in. Importantly, when we analyze the statements for the “benefit” of all countries or the “province” of all humankind, that does not mean that space should be a “no-person’s land,” particularly if “all countries” and “[hu]mankind” agree that space urgently needs a workable legal system.

### *B. UN: 1968 Rescue Agreement*

The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space was ratified by States parties in 1968 with the purpose of ensuring that persons or property of one State will be returned to that State if located by another participating State party.<sup>34</sup> It includes provisions mandating the return of property that may (1) be rescued from outer space; (2) fall from outer space and land in the territory of another State; or (3) fall from outer space and be found on the high seas.<sup>35</sup> These provisions essentially retain the original jurisdiction over space objects that may be recovered by another State following an accident or mishap. If an original State of jurisdiction can provide reasonable identifying information, the rescue State must return that property.

### *C. UN: 1972 Liability Convention*

The Convention on International Liability for Damage Caused by Space Objects contains distinct dispute resolution provisions concerning physical property that could provide groundwork for an intellectual property rights enforcement system to govern outer space activities.<sup>36</sup> Specifically, this agreement ties liability to applicable Launching States and specifies that States can claim Launching State rights based upon (i) the identity of the State that launches or procures the launching of a space object, and (ii) the

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<sup>34</sup> The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Dec. 3, 1968, 19 UST. 7570, 672 UNT.S. 119.

<sup>35</sup> *Id.* at art. V.

<sup>36</sup> Liability Convention, *supra* note 31.

territory or facility from where a space object was launched.<sup>37</sup> The Treaty allows for multiple States to be classified as a “Launching State” for a single object based upon shared connections to a particular launch, and permits for claims of joint and several liability as well as claims for contribution that resemble tradition common law tort damage mechanisms.<sup>38</sup> States are also free to mitigate or plan for potential damages through contractual arrangements of their own.<sup>39</sup>

This agreement contains detailed dispute resolution mechanisms that could conceivably be extended to future outer space IP claims. The following provides a detailed structure that could assist in addressing intellectual property disputes:

An option to present claims through diplomatic channels.<sup>40</sup>

Rights to damages due to gross negligence.<sup>41</sup>

A one-year statute of limitations.<sup>42</sup>

Establishment of a “claims committee” to review disputes, an arbitration panel composed of three arbitrators who are selected by the States party to the dispute (i.e., one selected by each State and a third selected by the two States mutually).<sup>43</sup>

A reserved freedom for States to form their own bilateral agreements to resolve future disputes.<sup>44</sup>

Reserved rights for States to seek remedies in their own courts, and specification that such local remedies are not required as a prerequisite for the use of other dispute resolution channels.<sup>45</sup>

A prohibition on obtaining “double damages” by seeking remedies for the same damages simultaneously through both

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<sup>37</sup> See *id.* at art. I.

<sup>38</sup> *Id.* at art. IV.

<sup>39</sup> *Id.* at art. V.

<sup>40</sup> *Id.* at art. IX.

<sup>41</sup> *Id.* at art. VI.

<sup>42</sup> *Id.* at art. X.

<sup>43</sup> *Id.* at art. XIV-XVI.

<sup>44</sup> *Id.* at art. XXII.

<sup>45</sup> *Id.* at art. XI.

national courts of a nation and the dispute resolution choices provided under the agreement.<sup>46</sup>

Arbitration enthusiasts are likely to find common ground with these mechanisms, as they resemble structures followed by internationally recognized bodies such as the London Court of International Arbitration (LCIA),<sup>47</sup> the Singapore International Arbitration Centre (SIAC),<sup>48</sup> and the New York International Arbitration Center (NYIAC).<sup>49</sup> However, the Liability Convention's freeform interpretations of jurisdiction and liability may be difficult, but not impossible, to apply in intellectual property disputes. This is because multiple States can qualify as a Launching State under this structure, and the interpretation of damages is not limited to activities in outer space and includes damages that may be encountered on Earth (e.g., damages that may result from a spacecraft's interim flight or any damages sustained on the Earth's surface).<sup>50</sup> This matters because the standard of liability and the potential number of responsible parties varies significantly depending on the location of the damage. Article II of the Liability Convention establishes an absolute liability regime for damage occurring on Earth, where the launching State is held absolutely liable without the need to prove fault.<sup>51</sup> On the other hand, damage occurring in outer space is governed under Article III of the Liability Convention, which establishes a system of fault-based liability where the claimant must prove that the launching State (or entity) was at fault in causing the damage.<sup>52</sup> Therefore, due to the fault-based liability regime, proving IP violations in space could be more difficult than proving damages occurring on Earth. For example, if a satellite improperly uses patented technology in outer space, the claimant must demonstrate fault instead of getting the benefit of an absolute liability

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<sup>46</sup> *Id.* at art. XII.

<sup>47</sup> London Court of International Arbitration, *LCIA Arbitration Rules* (2020), available at [https://www.lcia.org/Dispute\\_Resolution\\_Services/lcia-arbitration-rules-2020.aspx](https://www.lcia.org/Dispute_Resolution_Services/lcia-arbitration-rules-2020.aspx).

<sup>48</sup> A Singapore International Arbitration Centre, *About Us*, <https://siac.org.sg/about-us>.

<sup>49</sup> New York International Arbitration Center, *NYIAC* (July 1, 2023), <https://nyiac.org/>.

<sup>50</sup> *See* Liability Convention, *supra* note 31, at art. I, IV, V.

<sup>51</sup> *See id.* at art. II.

<sup>52</sup> *Id.* at art. III.

regime, which could involve complex jurisdictional and evidentiary challenges.

#### *D. UN: 1976 Registration Convention*

The Convention on Registration of Objects Launched into Outer Space provides some clarification on jurisdiction by establishing a formal recordation system for physical objects launched into space.<sup>53</sup> Specifically, it requires that eligible Launching States (i) maintain their own registry systems to document objects launched into space; and (ii) inform the UN Secretary-General of their establishment of such a registry system.<sup>54</sup> Space objects are defined as the objects themselves, their component parts, and any launch vehicles (along with their component parts).<sup>55</sup>

Details of registration requirements include the name(s) of the State(s) acting as the Launching State(s), a designator such as a registration number, the date of launch, orbital parameters, nodal period, inclination, apogee, pedigree, and a general description of the space object's function.<sup>56</sup> The obligations also apply to intergovernmental organizations as long as a majority of States involved in the organization are parties to the Treaty.<sup>57</sup> All parties to the Treaty are required to inform the UN once they become aware that a particular object has become inactive or has left orbit, and there is also a requirement to inform the Secretary-General of a designator or registration associated with any objects that may be "marked" at the time of their launch.<sup>58</sup>

One can easily imagine complementing this treaty with IP registration requirements, thereby generating a civil law-style deposit registration system for intellectual property such as trademarks, patents, copyrights, etc. However, conflicts about State claims may still arise due to the broad parameters permitted for qualifying as a Launching State. In addition, States could conceivably incorporate IP registration requirements in their national deposit systems

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<sup>53</sup> Convention on Registration of Objects Launched into Outer Space, Sept. 15, 1976, 18 UST 2410, 1023 UNT.S. 15.

<sup>54</sup> *Id.* at art. II.

<sup>55</sup> *Id.* at art. I.

<sup>56</sup> *Id.* at art. IV.

<sup>57</sup> *Id.* at art. VII.

<sup>58</sup> *Id.* at art. IV.

for State objects. Because a Launching State retains jurisdiction of its objects in outer space under the OST, it could be argued that the registration and use of any IP associated with said objects should be governed by the national laws of the Launching State. In fact, the United States has affirmatively stated this interpretation in its own national statute dedicated to outer space activities.<sup>59</sup>

### *E. UN: 1979 Moon Agreement*

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies focuses on activities on the Moon and other planets or space surfaces as its title suggests.<sup>60</sup> It reiterates the nonproprietary themes of the OST, namely that exploration and use “shall be the province of all [hu]mankind” and “carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development”<sup>61</sup> and specifies that the Moon is not subject to national appropriation by any claim of sovereignty (by use, occupation, or other means).<sup>62</sup> Although well-intentioned, only eighteen (18) countries have ratified this treaty and one has withdrawn.<sup>63</sup>

These recurring themes seem more a freedom from political claims of sovereignty (i.e., claiming Mars for Country X), than protection of personal property, whether physical or intellectual. This agreement mirrors the jurisdictional aspects of the OST by specifying that parties retain jurisdiction and control over personnel, space vehicles, equipment, facilities, stations, and installations on the Moon specifically, and the presence of such property on the Moon will not affect any State’s ownership rights.<sup>64</sup> The Moon

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<sup>59</sup> 35 USC. § 105 (2018) (“Any invention made, used or sold in outer space on a space object or component thereof under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States for the purposes of this title.”).

<sup>60</sup> The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 UNT.S. 3 [hereinafter Moon Agreement].

<sup>61</sup> *Id.* at art. IV.

<sup>62</sup> *Id.* at art. XI.

<sup>63</sup> Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcommittee on its Sixty-Second Session, *Status of International Agreements Relating to Activities in Outer Space as at 1 January 2023*, U.N. Doc. A/AC.105/C.2/2023/CRP.3 (2023); United Nations, Depositary Notification C.N.4.2023. TREATIES-XXIV.2 (Jan. 5, 2023) available at: <https://treaties.un.org/doc/Publication/CN/2023/CN.4.2023-Eng.pdf>.

<sup>64</sup> Moon Agreement, *supra* note 60, at art. XII.

Agreement also contains a clause encouraging the free exchange and movement of property, specifies a right of States to access property on the Moon, and prohibits States from conducting activities that would interfere with activities of other States.<sup>65</sup>

This Treaty could provide the framework for regulation and control over the flow of goods or services on the Moon should such trade ever arise. For example, jurisdiction would be confirmed upon export (departure from one State's Moon facility) and import (delivery to a different State's Moon facility). Any transitory activities could be approached in a manner resembling the existing international framework for regulating high seas that are summarized below; however, it should be noted that this framework is not harmonized.

#### *F. International Space Station Treaty*

The International Space Station Intergovernmental Agreement (IGA) has been signed by the 15 governments that are currently participating in activities conducted within the International Space Station (ISS).<sup>66</sup> It permits participating nations to extend their jurisdiction to the ISS, thereby creating different national zones that correspond to the separate pressurized modules of the ISS.<sup>67</sup> The IGA is the first to specify intellectual property protection as a primary objective; and traditional protections for patents, trade secrets, and even marking procedures are specified.<sup>68</sup> Jurisdiction is determined by the location of the activity pertaining to the intellectual property, specifically the pod or specific areas that may be under the control of a nation's particular ISS activities at a given time.<sup>69</sup>

The progressive approach of the IGA is somewhat mitigated by UN treaty obligations, namely adherence to the concept of using space to further the collective benefit of humankind. Of course, this reflects the ideal objective for any outer space initiatives, and the ISS Treaty therefore obligates parties to exchange technical data and goods "when necessary" to ensure that the ISS is operated

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<sup>65</sup> *Id.* at art. VIII.

<sup>66</sup> *See* Intergovernmental Agreement, *supra* note 14.

<sup>67</sup> *Id.* at art. V.

<sup>68</sup> *Id.* at arts. XVI, XXI.

<sup>69</sup> *Id.* at art. XXI.



effectively.<sup>70</sup> Nevertheless, the ISS provides a solid basis for States to claim control over any IP creation and use that may result from their activities.

Notably absent from the IGA is any structure regarding dispute resolution. Intellectual property claims are deferred to “the parties’ respective national regimes for intellectual property” and any contractual arrangements between parties.<sup>71</sup> The European Space Agency (ESA) has already mandated a contractual prerequisite for the use of its facilities, namely that parties using its facilities will agree to a waiver of liability and agree not to pursue their own arbitration claims or lawsuits concerning activities connected to the ISS.<sup>72</sup> As a result, any cooperating parties must agree with the ESA on the applicable law for disputes and arbitration procedures before conducting their ISS activities.

The issue of jurisdiction is likely to become a hot topic in response to the growth in research and commercial activities within the ISS. For instance, European nations that are situated thousands of miles from Japan on Earth are instantly within a space-walk of each other. Disharmonies in any intellectual property approaches will come into instant conflict, and the ISS Treaty as drafted is currently not suited to address such scenarios.

At best, Article 5(2) states that the exercise of jurisdiction and control over registered flight “elements” (i.e., pods) is subject to any relevant provisions of the agreement itself, the memoranda of understanding (MOU’s), and implementing arrangements such as relevant established procedural mechanisms.<sup>73</sup> This implies that some vague established procedural mechanisms are the designated tool to resolve intellectual property disputes, which is not an adequate solution for any serious conflict.

Furthermore, Article 23(1) does add a general clause recommending consultation and dialogue between partners to the treaty for any problems related to space station activities, which could be interpreted as some form of arbitration clause.<sup>74</sup> However, a

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<sup>70</sup> *Id.* at art. XIX

<sup>71</sup> *Id.* at art. XXI

<sup>72</sup> European Space Agency (ESA), *International Space Station Legal Framework*, ESA (July 1, 2023), [https://www.esa.int/Science\\_Exploration/Human\\_and\\_Robotic\\_Exploration/International\\_Space\\_Station/International\\_Space\\_Station\\_legal\\_framework](https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/International_Space_Station/International_Space_Station_legal_framework).

<sup>73</sup> Intergovernmental Agreement, *supra* note 14, at art. 5.

<sup>74</sup> *Id.* at art. 23.

general arbitration clause recommending consultation between partners is not suited to the complex and multifaceted issues which frequently arise in intellectual property disputes, and furthermore, the arbitration clause isn't even related to intellectual property, but to disputes in general.

Perhaps at some point, the ISS's Multilateral Coordination Board, the body comprising representatives from each participating party in the ISS,<sup>75</sup> will be able to hash out specific procedures for protecting data and goods within the ISS. However, this seems highly unlikely since the ISS will be decommissioned by the end of 2030 at the latest.<sup>76</sup>

#### IV. EXAMPLES OF NATIONAL LEGISLATION

##### A. *Australia*

The Space Activities Act was passed by the Australian legislature in 1998. Its current version includes (i) key terms of Australia's treaty obligations under the various UN treaties detailed above,<sup>77</sup> and (ii) terms of Australia's bilateral agreement with the Russian Federation concerning cooperation in the exploration and use of outer space for peaceful purposes.<sup>78</sup> The Space Activities Act covers space activities carried on or launched from Australia, and also binds Australian nationals who may conduct outer space activities from a different Launching State.<sup>79</sup>

While Australian space law does not iterate a formal stance on the legal status of intellectual property in outer space, it does permit future regulations to codify certain outer space intellectual property provisions detailed in Australia's 2001 bilateral agreement with the Russian Federation.<sup>80</sup>

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<sup>75</sup> Carlyle Webb, *Multilateral Coordination Board Joint Statement*, NASA (Mar. 5, 2019), <https://www.nasa.gov/feature/multilateral-coordination-board-joint-statement>.

<sup>76</sup> Michael Bock, *FAQ: The International Space Station 2022 Transition Plan*, NASA (Feb. 11, 2022), <https://www.nasa.gov/feature/faq-the-international-space-station-2022-transition-plan>.

<sup>77</sup> Space Activities Act, 1998 (Act No. 123, 1998) (Cth) pt III div 2 (Austl.) [hereinafter Austl. Space Act].

<sup>78</sup> *Id.* at sch 6.

<sup>79</sup> *Id.* at pt III div 1.

<sup>80</sup> Dan Morgan, *Recent Developments in Australian Space Law*, 13 Austl. Int'l L. J. 271, 271 (2001).

Article 7 of that bilateral agreement accounts for all intellectual property recognized by the WIPO Convention, including trademarks.<sup>81</sup> It encourages contractual arrangements by permitting the intellectual property agencies of these nations to reach their own separate agreements concerning conditions and principles that will be applied to intellectual property used or resulting from their joint outer space activities.<sup>82</sup>

### *B. United States*

The United States codified its own legislation regarding IP in outer space in the form of 35 USC. § 105 in 1990.<sup>83</sup> Section 105(a) of the statute states that “[a]ny invention made, used, or sold in outer space on a space object or component thereof under the jurisdiction or control of the United States shall be considered to be made, used or sold within the United States” subject to international agreements and foreign Launching State claims.<sup>84</sup> The international agreement component may support or prohibit US jurisdiction, and section 105(b) of the statute allows for the US to retain jurisdiction on a foreign space object if provided for in an agreement with a foreign State.<sup>85</sup>

The statute effectively extends all appropriate US federal laws to applicable activities in outer space, and it is conceivable that US federal trademark, copyright, and patent law could be extended under this statute to govern certain commercial activities in space.

### *C. United Kingdom*

The United Kingdom has an interesting statute entitled the “Outer Space Act” (1986) which, among other subjects, authorized the Outer Space (Jurisdiction) Order (1987) (Stat. Instruments 1987-1493) in which the UK criminal law was clearly extended to UK space objects.<sup>86</sup> Although this statute does not reference IP *per se*, it could apply to IP violations which are criminal, for example,

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<sup>81</sup> Austl. Space Act at sch 6, art VII.

<sup>82</sup> *Id.*

<sup>83</sup> *See* 35 USC. § 105.

<sup>84</sup> *Id.*

<sup>85</sup> *See* 35 USC. § 105(b).

<sup>86</sup> Outer Space (Jurisdiction) Order 1987, SI 1987/1493, art. 3 (UK).

counterfeiting. Several other countries have somewhat similar statutes, showing a movement in this direction.

#### V. LAW OF THE SEA

The laws regulating the high seas are frequently referred to as a potential model for the regulation of outer space, because like space, part of Earth's oceans exist outside the sovereignty of any individual nation. The primary convention governing the Earth's oceans is the UN Convention on the Law of the Sea (UNCLOS), an agreement that divides the seas into various territories based on their proximity to a nation's coasts.<sup>87</sup> Under UNCLOS, the waters near a nation's coasts are separated into: 1) territorial waters, the waters within 12 miles of a State's coast which the State has complete jurisdiction over;<sup>88</sup> 2) contiguous zones which can only be used to enforce various tax, immigration, and customs laws;<sup>89</sup> and 3) the still contested concept of exclusive economic zones which a State can only use for extracting and selling natural resources.<sup>90</sup>

The organized regime of UNCLOS provides an appealing method for regulating shared zones of outer space using the "flag law"<sup>91</sup> approach. However, practical issues remain concerning how to measure and govern outer space "quasi-territories" (a legal form of territory under international law where some form of low-level sovereignty exists). It should be noted that UNCLOS includes an abundance of independent State declarations and reservations, and that the United States has not ratified it. Conflicts in State views regarding fundamentals of international sea governance have been recently illustrated by fishing rights disputes, State disputes concerning rites of passage, and broad claims to land rights that can include reefs and atolls.<sup>92</sup>

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<sup>87</sup> The U.N. Convention on the Law of the Sea, Dec. 10, 1982, 1833 UNT.S. 397.

<sup>88</sup> *See id.* at art. 3.

<sup>89</sup> *Id.* at art. 33.

<sup>90</sup> *Id.* at art. 57.

<sup>91</sup> *See the Lotus Case, S.S. "Lotus" (Fr. v. Turk.)*, Judgment, 1927 P.C.I.J. (ser. A) No. 10 (Sept. 7).

<sup>92</sup> Sam Bateman, *UNCLOS and Its Limitations as the Foundation for a Regional Maritime Security Regime*, 19 KOREAN J. DEF. ANALYSIS 27 (2007).

## VI. HOW DO WE EXTEND IP PROTECTION TO OUTER SPACE IN THE FUTURE?

There is already a wide body of laws regulating physical property in outer space in the form of UN agreements and declarations, domestic legislation, and various international agreements. These laws can provide a foundation for regulating intellectual property and other forms of intangible property in outer space, and it would not be exceedingly difficult to add in several intellectual property provisions to the national laws, international customs, international treaties, and dedicated international organizations that already exist today. While there are many ways to approach IP rights in outer space, the three strategies listed below seem to be the most practical solutions to address the problem.

*Approach #1: Expansion of Current National and International Law to Off-World Issues*

An approach that can come into being immediately is for Earth-bound judges and arbitration panels to take jurisdiction *now*, whether in a contract choice-of-law and venue clause or merely on common law principles. For example, if there is a trademark franchise agreement for a fast-food restaurant in an orbiting hotel, and this agreement is breached by the franchisee, action can be taken back on Earth with no need for an orbiting court to decide. However, this situation becomes more complicated when there is no written contract. There might arise a scenario where some unnamed third party uses a competitor's trademark in an orbiting hotel without consent. Nevertheless, even this difficult problem is not unsolvable. The United States has made it clear that it intends to apply its "interstate commerce" principles to invention activities governed by 35 USC § 105, and thus it may be a clear next step for national IP rights to extend to US-claimed space property (a principle that could apply to any country or trading bloc such as the European Union). For these avenues to work, interested IP owners must begin the process of including IP clauses in contracts immediately and start testing these theories in courts to build a body of extraterritorial jurisdiction case law, much as was done concerning the internet

in the 1990s concerning the use of IP on “active” or “passive” websites.<sup>93</sup>

The statute could also establish a basis for extending intellectual property protection to outer space as it creates precedent for the extension of all IP law into outer space since patent law has already been extended to space. Review of other statutes strengthens this argument.

51 USC. § 51302 also encourages commercial exploration and recovery of space resources by United States citizens, which could also provide a legal basis for extending IP law into outer space.<sup>94</sup> Subsection a. of 51 USC. § 51302 states that the president shall:

1. Facilitate commercial exploration for and commercial recovery of space resources by United States citizens;
2. Discourage government barriers to the development in the United States of economically viable, safe, and stable industries for commercial exploration for and commercial recovery of space resources in manners consistent with the international obligations of the United States; and
3. Promote the right of United States citizens to engage in commercial exploration for and commercial recovery of space resources free from harmful interference, in accordance with the international obligations of the United States and subject to authorization and continuing supervision by the Federal Government.<sup>95</sup>

While intellectual property is not explicitly mentioned, there is a near universal agreement that intellectual property rights will be required for the commercial development of space and quite likely the future of space development and exploration itself.<sup>96</sup> Without clear intellectual property rights in space, it is quite

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<sup>93</sup> Kasey J Curtis, *Active vs. Passive Websites: How Businesses Can Navigate This Potentially Costly Distinction*, REEDSMITH.COM (Apr. 6, 2011), <https://www.reedsmith.com/en/perspectives/2011/04/active-vs-passive-websites-how-businesses-can-navi>. See the “Sliding Scale” approach articulated in *Zippo Manufacturing Co. v. Zippo Dot Com, Inc.*, 952 F. Supp. 1119, 1124 (W.D. Pa. 1997).

<sup>94</sup> US Commercial Space Launch Competitiveness Act, 51 USC. § 51302.

<sup>95</sup> 51 USC. § 51302(a).

<sup>96</sup> Rosario Avveduto, *Past, Present, and Future of Intellectual Property in Space: Old Answers to New Questions*, 29 WASH. INT’L L. J. 203, 238-39 (2019).

probable that investors will not want to risk funding space operations which may not be legal under the laws of their respective jurisdictions.<sup>97</sup> Therefore, an argument could be made that to facilitate the commercial exploration of space, and to discourage government barriers to the development of space exploration, intellectual property rights should be established under this statute.

Similarly, Executive Order 13914, titled Encouraging International Support for the Recovery and Use of Space Resources, also creates a precedent for the extension of IP protection to outer space.<sup>98</sup> The order states that

“Americans should have the right to engage in commercial exploration, recovery, and use of resources in outer space, consistent with applicable law. Outer space is a legally and physically unique domain of human activity, and the United States does not view it as a global commons. Accordingly, it shall be the policy of the United States to encourage international support for the public and private recovery and use of resources in outer space, consistent with applicable law.”<sup>99</sup>

While the Executive Order does not mention intellectual property specifically, since IP will almost certainly be required for the commercial development of space, this Executive Order could arguably be used to extend IP law into outer space.

Likewise, Space Policy Directive-1 (SPD-1), titled Reinventing America’s Human Space Exploration Program, also reiterates the idea that Americans should have the right to engage in the commercial exploration of space.<sup>100</sup> Since IP will play such a crucial role in the commercial exploration of space, SPD-1 could justifiably be extended to cover intellectual property rights in outer space.

In addition, section 6 of Space Policy Directive-2 (SPD-2), titled Streamlining Regulations on Commercial Use of Space, requires the Executive Secretary of the National Space Council review export licensing regulations affecting commercial space flight activity and develop recommendations to revise such regulations.<sup>101</sup>

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<sup>97</sup> Sandeepa Bhat B., *Inventions in Outer Space: Need for Reconsideration of the Patent Regime*, 36 J. Space L. 1, 5 (2010).

<sup>98</sup> Exec. Order No. 13,914, 85 Fed. Reg. 20381 (Apr. 10, 2020).

<sup>99</sup> *Id.*

<sup>100</sup> Space Policy Directive-1 of December 11, 2017, 82 Fed. Reg. 59,501 (Dec. 14, 2017).

<sup>101</sup> Space Policy Directive-2 of May 24, 2018, 83 Fed. Reg. 24,901 (May 30, 2018).

Since intellectual property, especially patents, could be classified as export material affecting commercial space flight activity, SPD-2 could be used to get the National Space Council to draft and recommend regulations covering IP rights in space.

Moreover, subsection b. of 15 USC. § 1126 states that

Any person whose country of origin is a party to any convention or treaty relating to trademarks, trade or commercial names, or the repression of unfair competition, to which the United States is also a party, or extends reciprocal rights to nationals of the United States by law, shall be entitled to the benefits of this section under the conditions expressed herein to the extent necessary to give effect to any provision of such convention, treaty or reciprocal law, in addition to the rights to which any owner of a mark is otherwise entitled by this chapter.<sup>102</sup>

While this statute likely meant the word person to refer to actual human beings, the statute does not define the word person, and therefore it could be argued that the term person could also refer to a legal entity, such as a corporation or the type of intergovernmental organization described in the Madrid Protocol.<sup>103</sup> If the term person does in fact refer to a legal entity and not an actual human, then any businesses or intergovernmental organizations created in space would be entitled to trademark protection under this statute.

Finally, subsection b. of 51 USC. § 50911 states that “No holder of a license under this chapter may launch a payload containing any material to be used for purposes of obtrusive space advertising.”<sup>104</sup> The term obtrusive space advertising is not clearly defined in this statute, however there is a possibility that the term obtrusive space advertising could be extended to include trademark infringement/trademark violations, since advertising that violates a company’s registered trademarks would probably be considered obtrusive space advertising by that company. Therefore, this statute could be used to regulate trademark violations in space by classifying them as obtrusive advertising.

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<sup>102</sup> Trademark Act of 1946, 15 USC. § 1126.

<sup>103</sup> See Protocol Relating to the Madrid Agreement Concerning the International Registration of Marks, June 27, 1989, 28 I.L.M. 1664, [hereinafter Madrid Protocol].

<sup>104</sup> 51 USC. § 50911.



Action Item: Include such clauses in all current agreements being negotiated, regardless of whether there are any immediate plans to use, develop, or create IP in space. IP recognition and enforcement can be controlled by contract to some extent until the off-world enforcement infrastructure is created. For example, a franchisee can recognize a franchisor's rights in a trademark in Earth's orbit regardless of whether they are "registered," and agree to an Earth-bound conflict resolution framework.

*Approach #2: Madrid Protocol Trademark Treaty Extension*

Using trademark law as an example, one of the simplest ways to extend trademark protection to outer space would be through the utilization of the Madrid Protocol system created under WIPO, which has 114 members covering 130 countries at the time of this writing.<sup>105</sup> The basic premise of the Madrid Protocol is that trademark owners in States that are members of the Protocol can extend their trademark rights to other foreign States by depositing their domestic trademark registrations at WIPO, and on the other hand trademark owners in foreign States can extend their trademark rights back through the same process.<sup>106</sup> It would not be exceedingly complex or difficult to extend this system to the registration of trademarks in outer space.

In a document titled Records of the Diplomatic Conference for the Conclusion of a Protocol Relating to the Madrid Agreement Concerning the International Registration of Marks,<sup>107</sup> there were several critical comments made during the summary minutes of the Madrid Protocol which indicated the delegates' intent for trademark protection to apply via intergovernmental organizations, even if such organizations are created in space. For example, Mr. Schwab, the delegation of the European communities, celebrated the fact that Article 14 of the Madrid Protocol would enable any intergovernmental organization to become a contracting party to the protocol so long as it established some sort of trademark office,

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<sup>105</sup> Madrid Protocol, *supra* note 103.

<sup>106</sup> *Id.*

<sup>107</sup> Records of the Diplomatic Conference for the Conclusion of a Protocol Relating to the Madrid Agreement Concerning the International Registration of Marks, (1989), [https://www.wipo.int/export/sites/www/treaties/en/docs/prep-docs/1989\\_june\\_Madrid\\_345-en.pdf](https://www.wipo.int/export/sites/www/treaties/en/docs/prep-docs/1989_june_Madrid_345-en.pdf).

without clarifying that such an office would have to be located on Earth.<sup>108</sup>

Additionally, on the same pages, Dr. von Mühlendahl, from the delegation of Germany, agreed, and stated that not only should the Benelux Trademark Office (BTO) and the European communities be able to become contracting members of the Madrid Protocol, but any regional organization or group should be eligible to become members of the Madrid Protocol.<sup>109</sup> He reasoned that there were several regions in the world where groups of nations wanted to abolish their national laws and replace them with a regional organization with regional laws, and that if such countries agreed to create an intergovernmental organization having legal capacity, then that organization should be able to become a member of the Madrid Protocol.

This is significant because it means that any intergovernmental organization, even if it has no attachment to a nation's national laws but is instead an entirely original entity composed of a regional legal system, might be eligible become a member of the Madrid Protocol. This reasoning would imply that a novel intergovernmental organization created for space, whether in orbit or on Earth, with a novel regional legal system divorced from any national law, might nevertheless be eligible to become a contracting party of the Madrid Protocol and thereby extend trademark protection into outer space.

Notably, Mr. Bogsch, the director general of WIPO at the time, agreed with this interpretation, furthering the idea that WIPO might allow an intergovernmental organization created in space for the purpose of regulating trademarks in space to become a contracting party of the Madrid Protocol.<sup>110</sup>

Additionally, 15 USC. § 1141l explicitly affirms the principle that intergovernmental organizations might become contracting members of the Madrid Protocol, stating that "An extension of protection may be assigned, together with the goodwill associated with the mark, only to a person who is a national of, is domiciled in, or has a bona fide and effective industrial or commercial establishment either in a country that is a Contracting Party or in a country

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<sup>108</sup> *Id.* at 264-68.

<sup>109</sup> *Id.*

<sup>110</sup> *Id.* at 267-68.

that is a member of an intergovernmental organization that is a Contracting Party.”<sup>111</sup>

A new protocol could be added to the treaty (which would need to amend the accession process in Article 14 of the Protocol to allow these areas to become jurisdictions) to expand protection to Earth’s orbit, the Moon, and Mars, which each member could either accept or reject. Another vehicle to extend the Protocol is to have Earth members state that their protection extends off-world (e.g., India declaring that its Madrid Protocol rights extend to an orbiting Indian hotel). A clear distinction should be made between whether registration can be *extended* to these areas, and whether the registration can be *enforced* there.

It is probable that enforcement will lag extension, but that should not be a reason for refusing to establish a system whereby rights are claimed, and notice is given to third parties of these claims. For example, if the ABC trademark is extended to the Moon by the Madrid system, but the lunar enforcement infrastructure is not yet created, a competitor of the owner of the ABC trademark may think twice before using ABC on the Moon. These rights may also be helpful in corporate due diligence schedules and financial balance sheets, and in establishing a larger trademark portfolio for possible security interests or licensing.

Action Item: Start now at the grassroots level to lobby governments, WIPO, and professional associations worldwide to add outer space to this treaty. Amending any treaty takes time, and even with best efforts, this amendment may not come into being before 2030.

### *Approach #3: New or Amended Treaties to Protect Intellectual Property in Space*

Of course, an obvious path to take is to create a new treaty specifically for intellectual property, like the intellectual property sections of the IGA. This treaty could fully develop the exact scope of protection for all forms of intellectual property and provide enforcement mechanisms, such as court or arbitration panel review, whenever violations occur. Alternatively, some of the current treaties listed above could be amended to include protection and enforcement mechanisms for IP in outer space. Several of the treaties

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<sup>111</sup> Madrid Protocol Implementation Act, 15 USC. § 11411.

noted above already protect physical property and do not have to be freshly negotiated, only the amendments need to be.

For example, the Registration Convention could be amended by including a one-sentence clause stating that IP rights and protection are extended to any IP created in outer space onboard a registered space object, with said rights and protections being the policies and laws of the Launching State. Alternatively, the OST could be amended (i.e., OST 2.0) by including a brief clause stating that IP rights do not infringe the “common benefit of all [hu]mankind” principle enshrined in Article II, opening up the door for States to begin creating statutes and treaties to regulate IP in space. Several approaches to what type of sovereignty would apply to lunar “landing zones” or space stations generally have been discussed, along with an Antarctica-style “condominium” joint ownership approach even mentioned.

In fact, an issue paper titled *Intellectual Property and Space Activities*,<sup>112</sup> WIPO pointed out the difficulty that a lack of normative intellectual property law imposes on businesses, investors, and governments, and stated its goal to harmonize the application of intellectual property law to outer space. WIPO acknowledges that the current state of intellectual property law is inadequate to deal with the upcoming privately-driven commercialization of space. However, any such treaty approach will take years if not decades to achieve, lagging *far behind* commercial reality in space.

## VII. CONCLUSION

When the international community first confronted IP on the internet, such as websites, domain names, and even social media at the beginning of the 21<sup>st</sup> Century, it was said the problem was too vast and overwhelming, and that solutions would be impossible. However, this problem was steadily solved, by establishing ICANN for domain names, DMCA copyright takedown procedures, protocols for social media, and related procedures. Now, an ever-larger challenge exists; extending IP protection to the vastness of space. However, we can start now to prepare for this very near future, regardless of whether the IP in question relates to Earth orbit, the Cislunar space between Earth and the Moon, the Moon itself, Mars,

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<sup>112</sup> See *Intellectual Property and Space Activities*, *supra* note 17 at 6-7.

or even to asteroids in the outer reaches of the solar system. The choice is ours: stay ahead of technology or be overwhelmed by it.