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A TRIBUTE TO PROFESSOR BIN CHENG (1921 - 2019)

This issue of the *Journal of Space Law* is dedicated as a tribute to Professor Bin Cheng, born in Beijing in 1921, who sadly died in October 2019.

Bin left China in 1936 to attend school in England when his father, Dr Tien-Hsi Cheng, was appointed judge at the Permanent Court of International Justice in the Hague and later China's Ambassador to the United Kingdom.

The family having been evacuated to Switzerland at the beginning of World War II, Bin was unable to take up his place at Trinity College, Cambridge, but attended the University of Fribourg where he graduated with a fist-class *Licence en Droit* degree. He continued his studies at University College London to gain his doctorate in 1950. He stayed at UCL for the next 36 years, rising from assistant lecturer to professor of air and space law, and twice dean of the law faculty. He travelled widely in his academic role, to Russia, Canada, the US, Australia, the Middle East and South America.

Bin's research and publications from the early 1950s developed and clarified many aspects of air and space law that were then in their infancy, and led him to be recognised across the world as an authority on international air and space law. Without his contribution to the development of air and space law they may not have existed in their present form, justifying his description as the Father of International Air Law and of Space Law.

His many publications have been influential and arguably definitive in establishing the discipline, dating back to his seminal work on international law, *General Principles of Law as Applied by International Courts and Tribunals* (1953, reprint 2006, Cambridge University Press) and *International Law and High Altitude Flights: Balloons, Rockets and Man-Made Satellites* (International & Comparative Law Quarterly, Vol. 6, Issue 3, July 1957). His Law of *International Air Transport* became a standard source of reference on the topic. During the height of the Cold War in the 1960s, Bin investigated the United Nations General Assembly's resolutions 1721 A (December 1961) and 1962 (December 1963) regarding legal principles governing outer space.

His extraordinary, authoritative and lasting contributions to the progressive development of general international law, air and space law have been acknowledged by the many honours he received, including:

Honorary LLD, Chinese University of Hong Kong (1978)

Officier, Ordre des Palmes Academiques, Government of France (1988)

Santos-Dumont Merit Medal, Government of Brazil (1989)

Lifetime Achievement Book Award, International Astronautical Federation (1997)

Honorary President, London Institute of Space Policy and Law (2008)

Honorary Fellow, Royal Aeronautical Society (2014)

Honorary Fellow, University College London

Lifetime Achievement Award, European Air Law Association (2010)

Among his many contributions to the refinement of international law is the development of the concept of instant customary international law, which may be created "over night" as long as *opinio juris* about its existence is not rejected by member states of the international community. He also refined the distinction between *jurisfaction* and *jurisfaction* elements of jurisdiction.

What is perhaps less well known about Bin is his skill with languages, fluent in French and numerous Chinese dialects and of course English. Not only was he an excellent tennis and table-tennis player, but also an accomplished joiner, lining his sitting room with book cases of which a professional would have been proud. Also, following his father's appointment as Ambassador in 1946, in a spirit of cultural exchange Bin produced a Chinese opera in the London's West End that was attended by Queen Mary.

Although Bin was not invited to China until 1982 he continued to maintain ties with Chinese universities. In 2017, he donated his collection of more than 3,000 books and legal documents to Northwest University of Politics and Law (NWUPL) in Xi'an, China, and

NWUPL established the Bin Cheng Air and Space Law Library and the Cheng Tien-Hsi International Law Library in memory of his father.

Above all Bin will always be remembered by colleagues, former students and all with whom he came into contact, for his immense modesty, generosity, integrity and civility. His total dedication to and love of learning was reflected in his frequent refrain, "There is always more to learn."

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FROM THE EDITOR

It has been a tremendous privilege to work with this roster of esteemed space law and policy experts on this issue, curated by Sa'id Mosteshar to honor Professor Bin Cheng. What is apparent from the articles herein is the incredible prescience and wisdom Professor Cheng brought to space law. His academic presence will forever permeate space law classes around the globe.

Professor Cheng, who we lost in October, 2019, was not here to experience the extraordinary year 2020 proved to be. A virulent virus forced humanity into isolation. Warm embraces and handshakes were shunned; smiles hid behind masks. And we all realized how much we took for granted the ability to travel to a conference and reconnect with colleagues or even to simply share a coffee with a new acquaintance or old friend. At the same time, the world got smaller. Schedules bloomed with webinars and panels that could be attended virtually from living rooms. New wells of patience were found as projects slowed or stalled as people grappled with illness and new realities. The *Journal of Space Law* was not immune and the entire editorial staff shares their gratitude and deepest appreciation to the authors for their tolerance, consideration and support as we managed our way through closed libraries, Zoom Bluebooking sessions across multiple time zones, infections and even a business-halting Mississippi snow storm to bring this issue to life.

As we emerge, cautiously, from this time of COVID, I hope we are able to hold on to lessons learned. Humans can survive in isolation – so long as we work to make our relationships endure. And they can with the help of technology. This is good news for our spacefaring progeny! What helped us survive were our ties to each other. As we strive to take the lessons of Bin Cheng with us into the next era of space law, let us never forget that law was created to build a peaceful humanity. It starts with people, not States.

Michelle L.D. Hanlon
Editor-in-Chief
Oxford, Mississippi
March, 2021

FROM THE GUEST EDITOR

PROFESSOR BIN CHENG MEMORIAL ISSUE

Professor Bin Cheng was the quintessential scholar and teacher, one of the earliest international lawyers to address international space law. It was clear that the space law community would wish to acknowledge his immense contribution to its development and impact on public international law following his sad death in October 2019.

The Journal of Space Law took on this rewarding task and honoured me with its invitation to guest edit this issue. Many colleagues enthusiastically offered to contribute articles. Unfortunately not all the excellent offers could be accommodated and some were prevented from completion in the challenging circumstances currently prevailing. But I believe those included are representative of the topics of interest to Bin and to those now active in the field.

On a personal note, I first met Bin in the early 1980s not long after focusing my barrister's practise on space law. One of his opinions was included in a set of instructions to me providing the opportunity to contact Bin for a discussion of the legal issues involved. We immediately formed a friendship that has inspired and rewarded me ever since.

It is a privilege to have participated in the preparation of this tribute to my friend Professor Bin Cheng. He is much missed by me and by the international law community.

Sa'id Mosteshar
BSc, MSc (Econ), DPhil, Barrister, Attorney (CA), FRAeS, CBE
Professor of Space Policy and Law, Director
London Institute of Space Policy and Law

STATE PRACTICES REGARDING INTERNATIONAL RESPONSIBILITY FOR NATIONAL ACTIVITIES IN OUTER SPACE

Dr. Kumar Abhijeet[*]

ABSTRACT

Increasing commercialization and privatization of space makes Article VI of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies[1] (Outer Space Treaty) much more relevant in contemporary times. Since 1998, when the late Professor Bin Cheng examined this Article, there has been a paradigm shift in regulation of activities of non-governmental entities globally. Though no new international space treaties have been formalized since 1979, many spacefaring nations have enacted national space legislation towards fulfilment of the requirements of Article VI of the Outer Space Treaty. Developing Bin Cheng's stellar work on the issue, this article attempts to describe a metaphysical understanding of Article VI of the Outer Space Treaty, as well as present a comparative study of implementation of this Article at the national level. It will examine the scope of national space legislation and will reflect upon whether such legislation is indispensable to Article VI of the Outer Space Treaty.

I. INTRODUCTION

Initially, the exploration and use of outer space was an exclusively governmental activity. Nevertheless, as early as the mid-

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DISCLAIMER - The views expressed in this paper are personal views of the author and must not be attributed to the Ministry/Government of India or the employers or the institutions with whom the author is or was associated. Any critique or shortcoming must be strictly attributed to the author only.

[1] 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].

1960s, it was envisaged that, at some point in the future, even private players would be entitled to reap the benefits of outer space activity. The drafting history of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies[2] (Outer Space Treaty) reveals a conflict of opinion on the issue of whether private entities should be entitled to explore and use outer space. Specifically, the Soviet Union believed all activities in outer space should be carried out "solely and exclusively by States,"[3] whereas the United States opposed this view as it had plans to engage private players in outer space.[4] As a compromise it was finally agreed that States would bear responsibility under international law for *all* space activities—including those undertaken by private entities. This compromise is expressed in the text of Article VI of the Outer Space Treaty.[5]

At the third Beijing conference on "Air and Outer Space at the Service of World Peace and Prosperity," held from August 21-23, 1995, Professor Bin Cheng had the opportunity to examine Article VI of the Outer Space Treaty. His paper, "International Responsibility and Liability for Launch Activities," was initially published

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[2] *Id.*

[3] Comm. on the Peaceful Uses of Outer Space, *Union of Soviet Socialist Republics: Draft Declaration of the Legal Principles Governing the Activities of States Pertaining to the Exploration and Use of Outer Space*, ¶ 7, U.N. Doc. A/AC.105/L.2, (Sept. 10, 1962).

[4] *See* Bin Cheng, *Article VI of the 1967 Space Treaty Revisited: "International Responsibility," "National Activities," and "The Appropriate State"*, 26 J. SPACE L. 7, 14 (1998).

[5] Outer Space Treaty, *supra* note 1, art. VI. The Article reads in full:

> States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space, including the moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.

Id.

in the *Air & Space Law* journal (1995)[6] and later republished in the proceedings of the conference (1998).[7] Cheng further developed his thoughts on Article VI in yet another paper published in 1998, "The 1967 The Outer Space Treaty: Thirtieth Anniversary," where he briefly discussed responsibility for space activities.[8] In this paper he considered Article VI of the Outer Space Treaty a revolutionary principle, in that makes the contracting States directly responsible internationally for national space activities, by whomsoever carried on.[9] However, he also felt that the term "national activities," and the term "appropriate State" in Article VI of the Outer Space Treaty require a great deal of certainty.[10] Finally, the very same year he was invited to contribute to the twenty-fifth anniversary volume of the prestigious *Journal of Space Law*, in which his stupendous paper "Article VI of the 1967 Space Treaty Revisited: 'International Responsibility,' 'National Activities,' and 'the Appropriate State'" examined Article VI of the Outer Space Treaty at length.[11]

To commemorate the fortieth anniversary of the launch of *Sputnik I*, which marked the beginning of the space age, and the thirtieth anniversary of the Outer Space Treaty, which created the overall framework of all space activities to date, a compendium of Cheng's selected writings on international space law was published by the Oxford University Press in a book entitled *Studies in International Space Law*.[12] This book offers a unique insight into the application of principles of public international law to the development and future of space law. One of Cheng's key conclusions is that for development of an international treaty three factors must be prima-facie met:

(i) there must be a felt need for the new rules;

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[6] *See* Bin Cheng, *International Responsibility and Liability for Launch Activities*, 20 AIR & SPACE L. 297 (1995).

[7] *See* Bin Cheng, *International Responsibility and Liability for Launch Activities*, *in* THE USE OF AIR AND OUTER SPACE: COOPERATION AND COMPETITION 159-190 (Chia-Jui Cheng ed., 1998).

[8] *See* Bin Cheng, *The 1967 The Outer Space Treaty: Thirtieth Anniversary*, 23 AIR & SPACE L. 156 (1998).

[9] *See id.* at 161.

[10] *Id.*

[11] *See* Cheng, *supra* note 4.

[12] BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW (1997).

> (ii) there has to be a propitious political climate; and
>
> (iii) . . . there has to be due representation of the interests involved.[13]

Perhaps this could be the plausible reason as to why no new space treaty has come since 1979.

Though Cheng has a galaxy of publications to his credit, his most famous article, "United Nations General Assembly Resolutions on Outer Space: 'Instant' International Customary Law?" which was published in the *Indian Journal of International Law* in 1965,[14] triggered a groundswell of discourse as to whether "customary international law" and "instantaneous" are reconcilable concepts. In his article, Cheng argued that *opinio juris* is the only necessary element for the creation of a customary international law and that, in certain cases (most particularly, in the field of space law) where widespread international agreement results in near-universal acceptance of legal principles related to a certain topic, the typical time factor involved in the creation of customary law may be eliminated. This argument seems to be irreconcilable with State practice, which suggests a certain amount of time must elapse before even a widely-accepted legal principle can evolve into an international customary rule.[15]

The topic under discussion, namely the exploration and use of outer space by non-government entities, is practically apposite in contemporary times because many space-faring countries are seeking to promote their national non-governmental entities' activities in outer space. After all, the participation of private entities in a State's outer space activities not only reduces the burden of the State's national exchequer, but also holds the prospect of creating phenomenal contributions towards a State's national economy and capacity-building in outer space. It has been more than five decades since Article VI of the Outer Space Treaty opened a gateway to space for private players. While much has been written on Article

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[13] *Id.* at 687.

[14] Bin Cheng, *United Nations Resolutions on Outer Space: 'Instant' International Customary Law?*, 5 INDIAN J. INT'L L. 23 (1965).

[15] *See* Abdul Korma, *The Breadth of International Law*, *in* IN HEAVEN AS ON EARTH? THE INTERACTION OF PUBLIC INTERNATIONAL LAW ON THE LEGAL REGULATION OF OUTER SPACE 20 (Stephan Hobe & Steven Freeland eds., 2013). *See also* North Sea Continental Shelf Cases (Ger. v. Den. and Ger. v. Neth.), Judgment, 1969 I.C.J. Rep. 3 (Feb. 20).

VI,[16] in view of its practical relevance, this author believes it will be useful to re-examine the subject.

This paper is written in several parts. The first two parts review the work of the late Professor Cheng on the topic and, because a number of terms used in this Article—for example, "international responsibility," "national activities," "the appropriate State Party," "authorization" and "continuing supervision"—require further analysis and interpretation, provides a conceptual understanding of the various terms relevant to examining Article VI. Since 1998, when Cheng re-visited Article VI of the Outer Space Treaty in the *Journal of Space Law*, the landscape for non-governmental activities in outer space has been radically transformed. Not only have multiple non-governmental entities[17] successfully launched objects into outer space, but the legal landscape for such activities has also undergone a significant metamorphosis. Despite the fact that no new international space treaties have been developed since 1979, many spacefaring nations have enacted national space legislation with an eye towards the implementation of their international responsibilities of "authorization" and "continuing supervision" for the activities of non-governmental outer space actors. The following parts of this paper undertakes a comparative study of States' implementation of these international responsibilities. It will examine the scope of national space legislation and reflect upon whether national space legislation is fundamental to Article VI of the Outer Space Treaty.

II. STATE RESPONSIBILITY UNDER PUBLIC INTERNATIONAL LAW

In order to appreciate international responsibility under existing international space law, it is essential to understand the nature of responsibility under public international law. In general language, the term "responsibility" means a "duty to deal with or take care of someone [or] something, so that it is your fault if something

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[16] *See* Cheng, *supra* note 4, at 8.

[17] SpaceX, Northrop Grumman, Blue Origin, Rocket Law are among the most prolific non-governmental launching entities. *See* Mike Wall, *The Private Spaceflight Decade: How Commercial Space Truly Soared in the 2010s,* SPACE.COM (Dec. 20, 2019), https://www.space.com/private-spaceflight-decade-2010s-retrospective.html.

goes wrong."[18] Cheng, however, simply considers it as "authorship of an act or omission."[19] In international law "State responsibility" is commonly considered in relation to States; nonetheless, other international persons, such as international organizations, could also be held responsible for their wrongful acts.[20] As Belgian space law expert, Jean-François Mayence notes, "States are responsible if the violation of international law can be attributed to them on the basis of an act or an abstention that has been committed by the government or its organs, but never on the basis of a third party's action or behavior."[21] In the *Chorzów Factory* case*,* the Permanent Court of International Justice stated: "[i]t is a principle of international law that the breach of an agreement involves an obligation to make reparation."[22]

While "State responsibility" has been a well-established principle of general international law, the International Law Commission (ILC) nevertheless identified this subject as its earliest topic for codification. At its fifty-third session in 2001, the ILC adopted the text of the "Draft Articles on Responsibilities of States for Internationally Wrongful Acts" (Draft Articles) and submitted it to the United Nations General Assembly (UNGA) as a part of the Commission's report.[23] The UNGA took note of the Draft Articles and recommended them to the attention of national governments without prejudice to the question of the future adoption or other appropriate actions.[24] Article 1 of the Draft Articles widely supported by practice, reiterates the general rule that every wrongful

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[18] *Responsibility*, OXFORD LEARNER'S DICTIONARIES, https://www.oxfordlearnersdictionaries.com/us/definition/english/responsibility (last visited Jan. 11, 2021).

[19] CHENG, *supra* note 12, at 603.

[20] *See* G. S. Sachdeva, *State Responsibility for the Space Activities of Private Actors*, *in* COMMERCIALISATION AND PRIVATISATION OF OUTER SPACE 13-30 (R. Venkata Rao & Kumar Abhijeet eds., 2016).

[21] Jean-Francois Mayence, *The Concept of State Responsibility for Private Space Activities*, *in* IN HEAVEN AS ON EARTH? THE INTERACTION OF PUBLIC INTERNATIONAL LAW ON THE LEGAL REGULATION OF OUTER SPACE 122 (Stephan Hobe & Steven Freeland eds., 2013)

[22] Case Concerning the Factory at Chorzów (Ger. v. Pol.), Judgment, 1928 P.C.I.J. (ser. A) No. 17 (Sept. 13).

[23] *See* Int'l Law Comm'n, *Titles and Texts of the Draft Articles on Responsibility of States for Internationally Wrongful Acts Adopted by the Drafting Committee on Second Reading*, U.N. Doc. A/CN.4/L.602/Rev.1 (July 26, 2001)[hereinafter Draft Articles].

[24] G.A. Res. 56/83, Responsibility of States for Internationally Wrongful Acts (Jan. 28, 2002).

act of a State entails responsibility.[25] Article 2 of the Draft Articles hinge State responsibility upon two important elements, that: (a) the internationally wrongful act is attributable to the State under international law; and (b) the internationally wrongful act constitutes a breach of an international obligation of the State.[26]

In the *Corfu Channel* case, the International Court of Justice (ICJ) held that an omission on the part of Albania, that it knew, or must have known, of the presence of the mines in its territorial waters and did nothing to warn third States of their presence, was a sufficient basis for Albania responsibility.[27] Similarly in the *United States Diplomatic and Consular Staff in Tehran* case the ICJ held that the responsibility of Iran was entailed by the inaction of its authorities, which failed to take appropriate steps in circumstances where such steps were evidently called for.[28] Therefore, breach of an obligation or legal duty whether commission or omission owed under international law by a State would primarily give rise to State responsibility. However, while a purely private act will not be attributable to a State, nevertheless the State may in certain circumstances be liable for its failure to prevent those acts or to take action to punish those responsible.[29]

II. STATE RESPONSIBILITY UNDER SPACE LAW

There is the general duty upon States to comply with international law. However, unlike State responsibility in general under the rules of public international law, under space law States bear international responsibility not only for State activities but also for the activities of their non-governmental entities.[30] A breach of this international responsibility likely even makes the State liable for compensation of damages. Article VI of the Outer Space Treaty prescribes,

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[25] Draft Articles, *supra* note 23, art. 1.

[26] *Id.* at art. 2.

[27] The Corfu Channel Case (U.K. v. Alb.), Judgment, 1949 I.C.J. Rep. 244, ¶ 4 (Apr. 9).

[28] United States Diplomatic and Consular Staff in Tehran (U.S. v. Iran), Order, 1981 I.C.J. Rep. 45, ¶ 3 (May 12).

[29] *See* BIN CHENG, GENERAL PRINCIPLES OF LAW AS APPLIED BY INTERNATIONAL COURTS AND TRIBUNALS 163-253 (1987).

[30] Outer Space Treaty, *supra* note 1, art. VI.

> States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty.[31]

A number of terms used in this Article require further analysis, which is provided below.

A. International Responsibility for National Activities

Article VI of the Outer Space Treaty imposes international responsibility upon States for their "national activities" in outer space. The words "whether such activities are carried on by governmental agencies or by non-governmental agencies"[32] clarifies that this international responsibility is irrespective of the author of the particular activity in outer space—meaning States bear international responsibility even for the activities of non-governmental agencies in outer space and "national activities" can include non-governmental activities.

Generally, treaties bind only the States and not private individuals. It would be fallacious to argue that the Outer Space Treaty only imposes international responsibility for non-governmental entities but does not prescribe a mechanism to bind the non-governmental entities. Precisely for this reason, Article VI of the Outer Space Treaty also imposes an obligation upon the State to "assure" that its activities in outer space are in compliance with the obligations the State has assumed under the Outer Space Treaty.[33] The word "assurance" affirms that for all activities in outer space—including those of non-governmental entities—the State stands as a guarantor for conformity to the obligations of the Outer Space

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[31] Outer Space Treaty, *supra* note 1, art. VI.

[32] *Id.*

[33] *Id.*

Treaty.[34] In this regard, the scope of State responsibility includes the flowing five principles.

i. Assurance of Freedom in Outer Space

Article 1 of the Outer Space Treaty affirms (i) freedom of exploration and use of outer space including the Moon and other celestial bodies, (ii) freedom of access to all areas of celestial bodies and (iii) freedom of scientific investigation in outer space, including on the Moon and other celestial bodies.[35] Freedom here connotes that any entity is free to explore or determine a possible use of outer space without any permission from any other State.[36] A State is free to take any space activity(s) including economic activities and even profit from these activities.[37]

The freedom in outer space including the Moon and other celestial bodies is not an absolute freedom. There are inherent limitations. Freedom shall be exercised for the "benefit and interests of all countries."[38] It reminds the States that outer space is not under the jurisdiction of specific States and, therefore, an activity carried out in outer space and on celestial bodies may not be undertaken for the sole advantage of States.[39] The freedom is to be exercised in a non-discriminatory manner, on the basis of equality.

ii. Non-appropriation Principle

The freedom of exploration and use of outer space is subject to the non-appropriation principle. As described in the Outer Space Treaty, "[t]he exploration and use of outer space . . . is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[40] The "non-appropriation" principle is the fundamental rule regulating the exploration and use of outer space that aims to protect outer space from the possibility of conflict driven by territorial or colonization-driven

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[34] *Id.*

[35] *Id.* at art. I.

[36] Stephan Hobe, *Article I, in* COLOGNE COMMENTARY ON SPACE LAW 34 (Stephan Hobe et al. eds., 2009).

[37] *Id.* at 35.

[38] Outer Space Treaty, *supra* note 1, art. I.

[39] *Hobe, supra* note 36, at 37.

[40] Outer Space Treaty, *supra* note 1, art. II.

ambition.[41] It prohibits sovereign or territorial claims in outer space. No amount of use or occupation in outer space will ever suffice to justify a claim of ownership rights over the whole or any part of outer space, including the Moon and other celestial bodies.[42]

iii. Peaceful Use of Outer Space

Article IV of the Outer Space Treaty strives to limit use of space to peaceful purposes only. It prohibits placing of nuclear weapons or weapons of mass destruction in orbit around the Earth.[43] The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers on celestial bodies is also forbidden, and the Moon and other celestial bodies are to be used exclusively for peaceful purposes.[44]

iv. Avoidance of Harmful Contamination

Article IX of the Outer Space Treaty may be considered as the basis for environmental protection of outer space and its preservation for peaceful use. States must

> conduct exploration of outer space, including the Moon and other celestial bodies, in such a way so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, [to] adopt appropriate measures for this purpose.[45]

States must ensure that activities of non-governmental entities either do not create debris, or, if they do, that the non-governmental entity has planned adequate debris remediation measures.

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[41] Steven Freeland and Ram Jakhu, *Article II*, *in* COLOGNE COMMENTARY ON SPACE LAW 48 (Stephan Hobe et al. eds., 2009).

[42] *Id.* at 53.

[43] Outer Space Treaty, *supra* note 1, art. IV.

[44] *See id.*

[45] *Id.* at art. IX.

v. Space Exploration in Accordance with International Law

Article III of the Outer Space Treaty widens the scope of State responsibility. It makes international law, including the Charter of the United Nations, applicable to space activities.[46] Judge Lachs has expressed that

> the obligation to conform with the Charter of the United Nations implies not only the application of provisions of international law as defined by it but also all those that have grown as a result of the further development of the United Nations and subjected to a new and more up-to-date interpretation.[47]

Thus, new principles, or even treaties, become applicable to space activities with the continued development of international law. It also indicates that both the governmental and non-governmental entities must be fully conversant with the rules of international space including all the pertinent treaties, on account of the international law rule of *pacta sunt servanda.*[48]

As Bin Cheng summarizes, Article VI of the Outer Space Treaty assimilates non-governmental space activities to governmental space activities, and there is an assumption of direct responsibility on the part of the State for non-governmental space activities.[49]

B. Authorization and Continuing Supervision

Having explained the general scope of State responsibility, this section focuses on the specific State responsibility stipulated in Article VI of the Outer Space Treaty wherein the activities of non-governmental entities in outer space require "authorization and continuing supervision" by the appropriate State Party to the Treaty. The duty to authorize ensures that the space activity a private entity intends to undertake is subject to prior approval of the

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[46] *Id.* at art. III.

[47] MANFRED LACHS, THE LAW OF OUTER SPACE: AN EXPERIENCE IN CONTEMPORARY LAW-MAKING 13 (2010).

[48] *See* Bin Cheng, *The Commercial Developments of Space: The Need for New Treaties*, 19 J. SPACE L. 17, 21 (1991).

[49] *See* Cheng, *supra* note 4, at 14.

State.[50] "Continuing supervision" ensures that an activity, which has been initially approved by the State, is also continuously monitored by the State, so that its conditions of authorization—including compliance with the provisions of the Outer Space Treaty—are followed not only at the start of the activity, but throughout the entire period of time in which the activity will be undertaken.[51] In order to achieve continuing supervision, States must provide means to receive information from the entities that have been granted authorization to conduct activities in outer space.[52] These means may include access to premises and facilities where space activities are being undertaken, as well as access to documents, sanction measures and the like. Failure to ensure authorization and continuing supervision of the activities of non-governmental entities in outer space may constitute yet another kind of State responsibility.[53]

i. Which State is Obliged to Authorize and Supervise?

The "appropriate State Party" to the Outer Space Treaty owes the obligation of subjecting the activities of non-governmental entities to authorization and continuing supervision.[54] But this raises a question: who is the "appropriate State Party?" The answer lies within Article VI of the Outer Space Treaty: the State Party which is responsible for national activities in outer space (including the activities of non-governmental entities) pursuant to the first sentence of Article VI. [55]

Under the general principles of public international law, a State that has jurisdiction over a particular activity in outer space may be regarded as the appropriate State for the purposes of authorization and continuing supervision.[56] A State has jurisdiction over any activity that is carried on from its territory as well as over

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[50] Ronald L. Spencer Jr., *International Space Law: A Basis for National Regulation*, *in* NATIONAL REGULATION OF SPACE ACTIVITIES 7 (Ram S. Jakhu ed., 2010).

[51] KUMAR ABHIJEET, NATIONAL SPACE LEGISLATION FOR INDIA 84 (2020).

[52] Michael Gerhard, *Article VI*, *in* COLOGNE COMMENTARY ON SPACE LAW 119 (Stephan Hobe et al. eds., 2009).

[53] *See* Cheng, *supra* note 4, at 14.

[54] Outer Space Treaty, *supra* note 1, art. VI.

[55] Gerhard, *supra* note 52, at 117.

[56] FRANS G. VON DER DUNK, PRIVATE ENTERPRISE AND PUBLIC INTEREST IN THE EUROPEAN SPACESCAPE 19 (1998).

an activity where its nationals are engaged.[57] Other than personal jurisdiction and territorial jurisdiction, the Outer Space Treaty confers a third kind of jurisdiction by virtue of the registration of space objects. Jurisdiction and control over a space object is retained by the State on whose registry an object is launched into outer space.[58] The legal consequence of jurisdiction and control is the right to apply national laws of the State of registry to the object launched into outer space.[59]

Responsibility to register space objects falls upon the "launching State," which is defined in the Convention on Registration of Objects Launched into Outer Space (Registration Convention) as meaning either "[a] State which launches or procures the launching of a space object" or "[a] State from whose territory or facility a space object is launched."[60] If there are two or more launching States, a decision must be made as to which State shall register the space object, because there can be only one State of registry for each such space object.[61] A single State of registry facilitates objectivity and finality with regard to jurisdiction and control of space objects, which ultimately facilitates the identification of the relevant national law applicable to the space object in question.[62] Thus, the registration of a space object creates the linkage between the appropriate State Party and the State responsible for activities in outer space.

Article VII of the Outer Space Treaty imposes liability for damage caused by space activities upon the launching State(s).[63] This principle was further developed in the Convention on International

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[57] *See* CHENG, *supra* note 12, at 632-34.

[58] Outer Space Treaty, *supra* note 1, art. VIII.

[59] *See* CHENG, *supra* note 12, at 663. *See also* Bernhard Schmidt-Tedd & Stephan Mick, *Article VIII*, *in* COLOGNE COMMENTARY ON SPACE LAW 159 (Stephan Hobe et al. eds., 2009).

[60] Convention on Registration of Objects Launched into Outer Space art. I, Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

[61] *Id.* at art. II.

[62] *See* Bernhard Schmidt-Tedd & Michael Gerhard, *How to Adapt the Present Regime for Registration of Space Objects to New Developments in Space Law?*, *in* IISL PROCEEDINGS OF THE 48TH COLLOQUIUM ON LAW OF OUTER SPACE 353-59 (2006); Bernhard Schmidt-Tedd & Michael Gerhard, *Registration of Space Objects: Which are the Advantages for States Resulting from Registration?*, *in* MARIETTA BENKÖ AND KAI-UWE SCHROGL, EDS., SPACE LAW: CURRENT PROBLEMS AND PERSPECTIVES FOR FUTURE REGULATION 122-23 (Marietta Benkö and Kai-Uwe Schrogl eds., 2005).

[63] Outer Space Treaty, *supra* note 1, art. VII.

Liability for Damage Caused by Space Objects (Liability Convention), which stipulates that, in cases involving the joint launch of a space object by multiple launching States (defined in the same way as the same term in the Registration Convention, described above), the liability is joint and several.[64] A reading of Article VI and VII of the Outer Space Treaty leads to the conclusion that a breach of international responsibility of Article VI can also give rise to a claim for compensation.[65] Such a reading seems to imply that a State will bear liability even for the damages resulting from the liabilities of non-governmental agencies. In other words, in international space law there is a "public liability for private activities."[66] The imposition of public liability for private activities stems from the fact that space activities are inherently ultra-hazardous. Because of the extreme amount of damage (and corresponding monetary value of such damage) space activities can cause, it is critical that some State Party be held responsible for its compliance with applicable rules of space law—regardless of whether its space activities are State-sponsored or undertaken by non-government entities.[67] Therefore, in practice, there can often be more than one appropriate State.[68] Nonetheless as the launching State(s) bears liability for damages, it will have a vital interest in being the State responsible for authorization and continuing supervision of the activities of non-governmental entities in outer space.

III. STATE PRACTICES TOWARDS INTERNATIONAL RESPONSIBILITY

Article VI of the Outer Space Treaty only mandates State Party compliance with the provisions of the Treaty itself, as well as their authorization and supervision of the space activities of non-governmental entities. Article VI does not, however, prescribe any particular mechanism for authorization and supervision.[69] States

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[64] Convention on International Liability for Damage Caused by Space Objects art. V, Nov. 9, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention].

[65] ABHIJEET, *supra* note 51, at 117.

[66] Frans G. von der Dunk, *The Origins of Authorisation: Article VI of the Outer Space Treaty and International Space Law*, *in* NATIONAL SPACE LEGISLATION IN EUROPE 5 (Frans G. von der Dunk ed., 2011).

[67] *Id.* at 9.

[68] *See* Cheng, *supra* note 4, at 29.

[69] *See* ABHIJEET, *supra* note 51, at 119.

are free to choose any method. In this regard Prof. Bin Cheng has expressed that "how the contracting States ensure compliance by those under their authority with their international obligations is usually left to the States themselves."[70] "Authorization and continuing supervision" being a procedural aspect, States will have to devise a mechanism for satisfying these requirements themselves.[71] Advancing the concept developed by Cheng, this section's focus is on how States in reality discharge their obligations enumerated in Article VI of the Outer Space Treaty. Many States have enacted national space legislation in response to fulfilment of their respective international obligations; nonetheless, States have often enacted it for their own national interests.[72] To this extent, the duty to "authorize and supervise" is popularly considered as the basis for national space legislation.[73] Though national space legislations are not legally binding at the international level they might serve as an *opinio juris*.[74] National legislation serves as an important source to decipher how States behave in practice and, in certain circumstances, may even form the basis of general (customary) international law.[75]

State practice suggests that almost all States exercise their territorial jurisdiction and personal jurisdiction over their national space activities, although often variation in approaches has been experienced.[76] The Austrian Space Act is applicable to space activities carried out on Austrian territory, on board vessels or airplanes registered in Austria or by Austrian citizen or legal persons seated

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[70] Cheng, *supra* note 4, at 13.

[71] *See* ABHIJEET, *supra* note 51, at 119.

[72] *Id.* at 43.

[73] *Id.* at 120.

[74] Stephan Hobe & Erik Pellander, *Space Law – a "Self-Contained Regime?"*, *in* IN HEAVEN AS ON EARTH? THE INTERACTION OF PUBLIC INTERNATIONAL LAW ON THE LEGAL REGULATION OF OUTER SPACE 8 (Stephan Hobe & Steven Freeland eds., 2013).

[75] MALCOLM N. SHAW, INTERNATIONAL LAW 60 (2019).

[76] *See* Cheng, *supra* note 4, at 24.

in Austria.[77] A similar approach is followed in Danish,[78] French,[79] Swedish,[80] Indonesian,[81] Australian, New Zealand and American national space legislation. The Russian Federation,[82] United Kingdom,[83] Ukraine[84] and South Korea[85] national space laws are generally applicable to all space activities under their jurisdiction. Other than territorial and personal scope, national space legislation also has material scope. Any activity in outer space for which a State bears international responsibility can be—indeed, must be—brought within the material scope of national space legislation and all such activities must be carried out in conformity with the provisions of the Outer Space Treaty.[86]

With respect to authorization, the general approach taken by all States is that no space activities can be undertaken without authorization unless granted an exemption by competent authority.[87] If a State is convinced that particular commercial activity may not be in conflict with its national security and safety and any of its

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[77] BUNDESGESETZ [BG] [AUSTRIAN OUTER SPACE ACT] BUNDESGESETZBLATT [BGBL] NO. 132/2011, as amended, § 1(1), https://www.ris.bka.gv.at/Dokumente/Erv/ERV_2011_1_132/ERV_2011_1_132.pdf (Austria). *See also* Irmgard Marboe, *The New Austrian Outer Space Act*, 61 GER. J. AIR & SPACE L. 44 (2012).

[78] S. 2 Danish Outer Space Act 2016 ("This Act applies to space activities carried out within the Danish State. Furthermore, this Act applies to space activities carried out outside the Danish State 1) on Danish craft or facilities; or 2) by Danish operators.").

[79] French space is applicable to any natural or juridical person carrying out a space operation under its responsibility. Loi 2008-518 du 3 juin 2008 relative aux opérations spatiales [Law 2008-518 of June 4, 2008 The French Space Operations Act], JOURNAL OFFICIEL DE LA REPUBLIQUE FRANÇAISE [J.O.] [Official Gazette of France], June 3, 2008, art. 1 [hereinafter French Space Operations Act].

[80] "Space activities may not be carried on from Swedish territory by any party other than the Swedish State without a licence. Nor may a Swedish natural or juridical person carry on space activities anywhere else without a licence." LAG OM RYMDVERKSAMHET § 2 (Svensk författnings-samling [SFS] 1982:963) (Swed.).

[81] Article 34 of the Indonesia Space Act of 2013.

[82] Zakon RF o Kosmicheskoy Deyatel'nOuter Space Treatyi [Law of the Russian Federation on Space Activity], Aug. 20, 1993, No. 5663-1, art. 1 (as amended by Federal Law No. 54-03, Apr. 15, 2019).

[83] The United Kingdom's Outer Space Act applies to space activities undertaken outside the territory of the UK. Outer Space Act 1986, c. 38 art. 1 (Eng.). Whereas the Space Industry Act of 2018 applies to space activities carried on in the United Kingdom. *Cf.* Space Industry Act 2018 c. 5 art. 1(1) (Eng.).

[84] Article 10 of the Ukraine Law on Space Activity of 1996.

[85] Hang-gong uju san-eob baljeon chogjinbeob [Aerospace Industry Development Promotion Act], Act No. 14839, July 26, 2017, art. 11(1) (S. Kor.).

[86] *See* ABHIJEET, *supra* note 51, at 46.

[87] *Id.* at 53.

international obligations or an activity is needed in governmental interest, exoneration from authorization requirement may be extended to such activities.[88] Study of the space legislation of various States suggests that authorization is usually achieved by way of licensing, often termed as "approval," "permit," "certification," "authorization" or "license."[89] There are two usual ways of authorization: (i) authorization of space activities through a single license and (ii) authorization of a particular space activity through multiple licenses. Austria, Belgium, Denmark, France, The Netherlands, The Russian Federation, Sweden, UK, Ukraine, Japan, Kazakhstan and South Africa, regulate all space activities falling within their respective jurisdictions by way of a single license. Australia has prescribed different categories of authorization for different types of space activity: a "space license" for operating a launch facility in Australia;[90] a "launch permit" to launch a space object from Australia[91] or return of a space object to Australia;[92] an "overseas launch certificate" for an Australian national seeking launch of space object outside Australia;[93] and an "authorization" for the return of a space object to a place anywhere in Australia of a space object that was not launched from the territory or facility within Australia.[94] Similarly, in the United States, a commercial operator seeking launch from a private launch site requires two sets of licenses – one for the launch vehicle and the other for the launch site.[95]

Whether it is single licensing mechanism or a multiple licensing mechanism, the general conditions of authorization remain the same.[96] Safeguard of national security and safety as well as compliance with international obligations have been of paramount

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[88] *Id.* at 54.

[89] *Id.*

[90] *Space Activities Act 1998* (Cth) s 15 (Austl.).

[91] *Id.* s 11.

[92] *Id.* s 13.

[93] *Id.* s 12.

[94] *Id.* s 14.

[95] *See* Pamela L. Meredith, *A Comparative Analysis of United States Domestic Licensing Regimes for Private Commercial Space Activities*, *in* PROC. OF THE THIRTY SECOND COLLOQUIUM ON THE LAW OF OUTER SPACE 375 (1989). *See also* Petra A. Vorwig, *Regulation of Private Launch Services in the United States*, *in* NATIONAL REGULATION OF SPACE ACTIVITIES 406 (Ram S. Jakhu ed., 2010).

[96] ABHIJEET, *supra* note 51, at 58.

consideration for granting authorization of any space activity.[97] In addition, technical and financial conditions of the applicant—including recourse against liability, transfer of license and registration of space objects—have been a crucial factor.[98]

Article VI of the Outer Space Treaty not only requires States to authorize the activities of non-governmental activities, it also requires that all such authorized activities be continually supervised. State practice suggests that supervision of space activities has generally been achieved by inspection of the facilities and receiving information about the activities.[99] An authorized activity is to be performed strictly in compliance with the conditions of authorization.[100] In the event of new or changed circumstances of significance for an authorized space activity, the operator also has a duty to promptly inform the State authorities about the deviation.[101] If the situation demands, the State may issue directions for compliance, search and seize documents, or take other measures necessary to address the issue.[102] For this purpose, State authorities are also empowered to access the business premises, inspect relevant documents and seek any other information from the operator.[103] Noncompliance with the conditions of authorization or directions may also invite suspension or even revocation of authorization.[104] An occasion to terminate or revoke a license may arise if the operator does not comply with licensing conditions, which may be when an activity is in breach of any of the international obligations or in breach of statutory provisions or in breach of authorization regulations; activity likely to impair public health or safety; jeopardize national interest or security. The United Kingdom, Brazil and many others have prescribed even the bankruptcy of a licensee as a ground for suspension or revocation.[105]

Mere suspension or revocation of authorization does not absolve the operator of their obligations. Most legislation has included

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[97] *Id.* at 116.
[98] *Id.*
[99] *See id.* at 58.
[100] *Id.*
[101] *Id.*
[102] ABHIJEET, *supra* note 51, at 58.
[103] *Id.*
[104] *Id.* at 60.
[105] Article 21(I) of the Administrative Edict 27/2001.

continuation of obligation even after termination of authorization. In France, the authority may also enjoin the operator to take, at its own expenses, appropriate measures regarding the commonly admitted good rules of conduct to limit the risk of damage due to that object.[106] Supplementing these provisions, all national space legislations seem to agree that violation of their acts or licensing condition shall invite sanction.[107] State practice suggests that there is no uniformity with regard to degree of sanctions. Some prescribe for monetary fines, while others criminalize violating any of the licensing or statutory conditions with penalties including potential imprisonment. The quantum and nature of sanctions are often dependent upon the individual internal policy of a State, the nature of the State's respective space legislation, provisions contained therein and the licensing conditions.[108]

IV. NATIONAL SPACE LEGISLATION INEVITABLE TO STATE RESPONSIBILITY?

Everything that is done by non-governmental entities is deemed to be an act imputable to the State as if it was its own act and the State bears direct responsibility for the same.[109] Conversely, a breach of any of the provision of the Outer Space Treaty by a non-governmental entity will also entail direct responsibility of the State.[110] Furthermore, State responsibility commences right from the moment the breach is committed and not when the State has earliest reasonable opportunity to prevent the continuation of its breach.[111]

The Outer Space Treaty not only establishes a direct link between the State and private entities; it also creates a strong incentive to enact national space legislation.[112] This incentive lies in the fact that activities by private entities that violate international law

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[106] French Space Operations Act, *supra* note 79, art. 9.

[107] *See* Kumar Abhijeet, *State Practices Towards National Space Legislation*, *in* COMMERCIALISATION AND PRIVATISATION OF OUTER SPACE – ISSUES FOR NATIONAL SPACE LEGISLATION 86 (R. Venkata Rao & Kumar Abhijeet eds., 2016).

[108] *See* NATIONAL SPACE LEGISLATION – A COMPARATIVE AND EVALUATIVE ANALYSIS 179 (Annette Froelich & Vincent Seffinga eds., 2018).

[109] Cheng, *supra* note 4, at 15

[110] *Id.*

[111] *Id.*

[112] *See* Abhijeet, *supra* note 107, at 9.

give rise to the international responsibility of the State, including liability to compensate for damages and, thus, States have a legitimate interest in regulating such activities.[113] Although the duty to "authorize and supervise" is widely seen as the basis for national space legislation, it does not necessarily require the enactment of such legislation.[114] In the absence of legislation, authorization and supervision may be achieved through contractual agreement, which is the current practice in India or through the use of administrative edicts, as in the case of Brazil.[115] While these alternate methods are much faster and easier, authorization through the provisions of national space law is the most preferable, comprehensive and transparent means of exercising supervision and control, as well as ensuring proper domestic handling of international liabilities.[116] The international obligations flowing from the space treaties are so complicated that legislation will always be more advantageous than any other process.[117]

V. CONCLUSION

Space activities are no longer an exclusive domain of government but rather there has been an increasing trend in the participation of non-governmental entities in outer space. Article VI of the Outer Space Treaty defines the relation between the State and non-governmental entities vis-à-vis activities in outer space. The State assumes direct responsibility for the activities of non-governmental entities in outer space. Such activities are assimilated to their own so far as compliance with the provisions of the Outer Space Treaty and international law is concerned. The activities of non-governmental entities in outer space are subject to authorization and

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[113] *Id.*

[114] *See* JULIAN HERMIDA, LEGAL BASIS FOR A NATIONAL SPACE LEGISLATION 29-32 (2004); Elisabeth Back Impallomeni, *Necessity for the Development of National Space Law*, *in* NATIONAL SPACE LAW: DEVELOPMENT IN EUROPE – CHALLENGES FOR SMALL COUNTRIES 29 (Christian Brünner & Edith Walter eds., 2008); Valérie Kayser, *Commercial Exploitation of Space: Developing Domestic Regulation*, 17 ANN. AIR & SPACE L. 187, 190 (1992).

[115] *See* José Monserrat Filho, *Regulation of Space Activities in Brazil*, *in* NATIONAL REGULATION OF SPACE ACTIVITIES 71-74 (Ram S. Jakhu ed., 2010).

[116] Frans G. von der Dunk, *The International Law of Outer Space and Consequences at the National Level for India: Towards an Indian National Space Law*, *in* INDIAN YEARBOOK OF INTERNATIONAL LAW AND POLICY 154 (Satyam Chatterjee ed., 2010).

[117] *See* ABHIJEET, *supra* note 51, at 114.

continuing supervision of the State under whose jurisdiction the non-governmental entities operate. A failure to diligently discharge this duty may even make the State liable for compensation for damages because, unlike generalized State responsibility under the traditional rules of international law, States bear responsibility even for the activities of their non-governmental entities.

National legislation often serves as an important source to determine how States behave in practice. Most of the spacefaring nations have enacted national space legislation, largely in response to their international responsibility to authorize and supervise the activities of their non-governmental entities. Though national space legislation is neither a requirement of international law, nor a specific requirement of Article VI of the Outer Space Treaty, practice suggests that national space legislation is a logical corollary to the requirement of "authorization and supervision" of activities of non-governmental entities in space. Based on State practices, it can be concluded that national space legislation is an evolving trend towards regulation of the activities of non-governmental entities in outer space.

NATIONALITY FOR SPACECRAFT? REVISITED: NATIONALITY TO BE FOUND

Setsuko Aoki[*]

ABSTRACT

Professor Bin Cheng wrote in his phenomenal article, *Nationality for Spacecraft?* that "[n]ationality for spacecraft would sweep away much of the confusion which now prevails regarding jurisdiction over space objects."[1] Professor Cheng was of the view that an ensured exercise of quasi-territorial jurisdiction stemming from the nationality over a space object will solve such confusion. The present author agrees with the view expressed by Professor Cheng. This article is to prove that nationality has been implicitly conferred to space objects since around the beginning of 2010s due to the development of State practice and United Nations General Assembly (UNGA) resolutions including specifically the Registration Practice Recommendations.[2] This article consists of five parts excluding introduction. First, the importance of nationality in establishing quasi-territorial jurisdiction is confirmed. Second, five common criteria of nationality for ships and aircraft are identified to compare with the case of space objects. Third, the characteristics of the mechanism to exercise jurisdiction and control under the United Nations (UN) Space Treaties is confirmed in terms of registration as an unstable link. Fourth, State practice of on-orbit transfer of ownership or control of satellites and relevant UNGA resolutions are studied to prove that now five common criteria of nationality are also satisfied by space objects. The major findings in the concluding remarks are:

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[1] "Nationality for Spacecraft?" was first published as Bin Cheng, *Nationality for Spacecraft?*, *in* AIR AND SPACE LAW: DE LEGE FERENDA - ESSAYS IN HONOR OF HENRI A. WASEENBERGH 202-17 (T. L. Masson- Zwaan & P. M. J. Mendes de Leon eds., 1992). This article was later included in his book published in 1997. The present article uses the pagination of the book version. *See infra* note 3, at 491.

[2] G.A. Res. 62/101 (Dec. 17, 2007) [hereinafter Registration Practice Recommendations].

i) Nationality is implicitly conferred via registration on a space object by the State which has genuine link. The primary genuine link is the "procuring launching State;"

ii) However, identifying the procuring launching State is not necessarily easy. Thus, the secondary genuine link, the responsible State under Article VI of the Outer Space Treaty, could be used. This is a weaker link than a procuring launch State, but if a State registers a satellite based on this link, this becomes the primary genuine link;

iii) The national State of the operator who has effective control over a space object is under the obligation to exercise effective jurisdiction and control, which is accomplished by observing the safety operation requirements under the UN Space Treaties, the relevant non-legally binding UNGA resolutions and other relevant instruments;

iv) The method of identification of nationality (registration) is duly enriched by the Registration Practice Recommendations and national space acts reflecting them; and

v) Without registration, space objects would be Stateless. Hence, awareness raising for registration is critical.

I. INTRODUCTION

In his phenomenal article, *Nationality for Spacecraft?*[3] Professor Bin Cheng, a giant of international law, expressed his profound conviction that a straightforward grant of "[n]ationality for spacecraft would sweep away much of the confusion which now prevails regarding jurisdiction over space objects, confusion inherent in the various treaties on outer space which has been made more confounded by *inter alia* Article II of the Registration Convention."[4] Indeed, it seems peculiar that nationality is not granted to spacecraft as a means for a specific State to exercise jurisdiction over its space objects in outer space, considering that outer space is beyond national jurisdiction.[5] Professor Cheng inferred several reasons which accounted for the lack of reference to nationality in the UN

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[3] BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 475-491 (1997).

[4] *Id.* at 491.

[5] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, esp. arts. I & II, Jan. 27, 1967, 18 U.S.T.2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

treaties on outer space[6] (UN Space Treaties). Among the more significant reasons he identified were: (i) the shared view that was prevalent in the 1960s and 1970s that the blossoming of private space activities would be a distant prospect; and (ii) the perception of many States that they would not be able to carry out space activities individually and could only do so by international cooperation, including through international intergovernmental organizations (IGO).[7] IGOs cannot grant nationality and the exercise of extraterritorial sovereign authority, based on nationality, would only be meaningful in case of actual private participation in space activities.

Thus, if only States and IGOs conducted space activities, other connections could more effectively govern orderly development of space activities, instead of nationality. This would explain the choice of the "launching State"[8] and a subset, the "State of registry,"[9] to identify the State responsible for liability and other consequences of internationally wrongful acts. The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies[10] (Outer Space Treaty) includes the unique rule that States Parties are directly responsible, internationally, for both governmental and non-governmental space activities,[11] which was considered an effective way to strengthen State responsibility for ultra-hazardous activities. As an important role of IGOs with regards to space activities was envisioned, certain criteria were set forth for them to be

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[6] The United Nations treaties on outer space refers to the five treaties adopted in the UN General Assembly: (i) the Outer Space Treaty, *supra* note 5; (ii) the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, April 22, 1968, 19 U.S.T. 7570, 672 U.N.T.S. 119 [hereinafter Rescue Agreement]; (iii) Convention on International Liability for Damage Caused by Space Objects, March 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention]; (iv) Convention on Registration of Objects Launched into Outer Space, June 6, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention]; and (v) Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement].

[7] CHENG, *supra* note 3, at 482, 489-90.

[8] Outer Space Treaty, *supra* note 5, art. VII; Liability Convention, *supra* note 6, art. I(c); Registration Convention, *supra* note 6, art. I(a).

[9] Outer Space Treaty, *supr*a note 5, art. VIII; Registration Convention, *supra* note 6, art. I(c).

[10] *See* Outer Space Treaty, *supra* note 5.

[11] *Id.* at art. VI.

kind of associate parties to the UN Space Treaties, excluding the Outer Space Treaty.[12]

As such, when Professor Cheng found such prerequisite had disappeared in the last decade of the 20th century, he concluded: "what seems needed is serious reconsideration whether, after all, especially since commercial and private activities in outer space have now fully taken off, it would not be best to revert to the well-established concept of nationality in linking space objects to the subjects of international law."[13]

The present author agrees, in general, with the view expressed by Professor Cheng concerning the preferability of the nationality of space objects. Cheng stated "some modification of both Article VIII of the Space Treaty and the Registration Convention will be necessary," [14] including the possibility of *de facto* amendments through subsequent practice.[15] The problem is that amending a multilateral treaty is exorbitantly difficult, particularly given the consensus system operating in the UN Committee on the Peaceful Uses of Outer Space (COPUOS).[16] When the last of the UN Space Treaties, the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies[17] (Moon Agreement) was adopted in 1979, COPUOS had 47 members. As of 2020, that number has increased to 95 States.[18] Given that the number of COPUOS States has more than doubled since the last treaty was adopted, the prospect of amending two treaties within the next decade seems almost impossible. However, the private human space activities which truly necessitate the determination of nationality for space objects, may duly take off in the 2020s.

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[12] Outer Space Treaty, *supra* note 5, arts. VI & XIII; Rescue Agreement, *supra* note 6, art. 6; Liability Convention, *supra* note 6, art. XXII; Registration Convention, *supra* note 6, art. VII; Moon Agreement, *supra* note 6, art. 16.

[13] CHENG, *supra* note 3, at 490. The preference of a well-tested concept of nationality rather than the less precise "launching States" is referred to in: MYRES S. MCDOUGAL, HAROLD D. LASWELL & IVAN A. VLASIC, LAW AND PUBLIC ORDER IN SPACE 543-44 (1963).

[14] CHENG, *supra* note 3, at 490.

[15] *Id.*

[16] U.N. Doc. A/AC.105/PV.2, at 4 (Mar. 19, 1962). *See* Cheng, *supra* note 3, at 128.

[17] *See* Moon Agreement, *supra* note 6.

[18] *See Committee on the Peaceful Uses of Outer Space: Membership Evolution*, U.N. OFF. OUTER SPACE AFF., https://www.unoosa.org/oosa/en/ourwork/copuos/members/evolution.html (last visited Nov. 24, 2020).

Therefore, this article will take another approach: to study if it is possible to conclude that nationality has been already implicitly granted to space objects through State practice and the accompanying development of non-legally binding instruments made in the UN.

First, the function of nationality within transportation systems is confirmed as the means of establishing effective enforcement jurisdiction in areas otherwise beyond national jurisdiction. Second, the implications of nationality on ships and aircraft are studied to compare with the nationality of space objects which is covered in Part V. Third, the "inconsistencies, ambiguities, and pitfalls"[19] in the UN Space Treaties, as expressed by Professor Cheng, are studied, especially those within the Outer Space Treaty and the Convention on Registration of Objects Launched into Outer Space[20] (Registration Convention). The drafting history of the Registration Convention is briefly touched upon to explore if conferring of nationality to space objects was intended at all. Fourth, State practice of on-orbit transfer of ownership or control of satellites in the 21st century is studied, because the present author finds this category of space activities has contributed to identify a genuine link to implicitly grant nationality to space objects among new space activities. Finally, concluding remarks will note that nationality has already been conferred to space objects since around the beginning of the 2010s and that nationality of space objects would be widely recognized with the increased development of private human space activities.

In his article, *Nationality for Spacecraft?*, Professor Cheng uses both "spacecraft" and "space objects" without defining them, and it seems that both words are used interchangeably. Another of his articles, which is included in the same book and focuses on the legal status of spacecraft, satellites and space objects, regards "space objects" as "the generic term used to cover spacecraft, satellites, and in fact anything that human beings launch or attempt to launch into space, including their components and launch vehicles, as well as parts thereof."[21] Following Cheng's example, the present

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[19] CHENG, *supra* note 3, at 486-89.

[20] *See* Registration Convention, *supra* note 6.

[21] CHENG, *supra* note 3, at 463.

article uses the term "space objects" as a comprehensive notation of all human-made objects launched into outer space.

II. THE INDISPENSABLE QUASI-TERRITORIAL JURISDICTION ENABLED ONLY BY THE NATIONALITY OF SPACE OBJECTS

Nationality for Spacecraft? starts by confirming the two most important functions of international law: the first is to maintain the *status quo* and provide peaceful means to bring about changes; and the second is to ensure proper demarcation of the powers of the subjects of international law (States, IGOs, and in a very limited sense, individuals) over the objects of international law (territories, ordinary persons and other objects, including space objects), as well as laying down rules for the peaceful settlement of disputes in exercising such powers.[22] For these purposes, over the past centuries States have developed fundamental premises to distribute and allocate the objects of international law by mutually recognizing full authority over their national territories (territorial jurisdiction) and additional authority to their own objects of international law granted by their national imprint called "nationality" (personal jurisdiction).[23]

International law has developed rules on the hierarchy of the exercise of State jurisdiction, through refining categories of jurisdiction which at present often divide into (i) jurisdiction to prescribe (prescriptive/legislative jurisdiction), (ii) jurisdiction to adjudicate (adjudicative/judicial jurisdiction) and (iii) jurisdiction to enforce (enforcement jurisdiction).[24] According to his specific terminology, Cheng divided national jurisdiction into *jurisfaction*, which "represents the normative element of State jurisdiction"[25] and *jurisaction*, which enables actually "to implement and to enforce its laws and decisions."[26]

Under customary international law, jurisdiction to enforce, which would, in principle, correspond to Cheng's *jurisaction*, is

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[22] *Id.* at 475.

[23] *Id.* at 477.

[24] *See* William S. Dodge, *Jurisdiction, State Immunity, and Judgments in the Restatement (Fourth) of US Foreign Relations Law*, 19 CHINESE J. INT'L L. 106-25 (2020). For examples of the dichotomy of national jurisdiction as (i) jurisdiction to prescribe and (ii) jurisdiction to enforce, see MALCOM N. SHAW, INTERNATIONAL LAW 483 (8th ed. 2012).

[25] CHENG, *supra* note 3, at 480.

[26] *Id.*

strictly territorial and may not be exercised in the territory of another State, unless there is a special agreement permitting it.[27] Only one State may exercise *jurisaction* over a specific object in international law, while *jurisfaction* may be exercised concurrently by multiple States. If a national of State A is a passenger on a ship with the nationality of State B that is berthed in the port of State C, States A, B and C all have *jurisfaction* based on either the territorial principle or the nationality principle; conversely, only State C has *jurisaction* and may exclusively exercise its national power to actually enforce its laws and decisions.[28]

The example above would also indicate an interesting character of jurisdiction that a State possesses over ships and aircraft. That is, the extraterritorial jurisdiction of which partakes of the nature of both personal jurisdiction and territorial jurisdiction. When a ship navigates or an aircraft flies on or over the high seas which is the area beyond national jurisdiction, because no territorial jurisdiction shall be exercised, the national State of the ship or aircraft enjoys *jurisaction* over them and persons therein. Such extraterritorial jurisdiction is called "quasi-territorial jurisdiction," not because ships or aircraft are thought as a "floating territory," a concept which has long been deceased,[29] but because this jurisdiction functions "more akin to territorial jurisdiction than personal jurisdiction"[30] due to the nature of the ships or aircraft as means of transportation in which a self-contained human community is established.

"International law establishes a strict hierarchy among *jurisactions*. In case of concurrence, territorial *jurisaction* overrides both quasi-territorial and personal *jurisactions*, whilst quasi-territorial *jurisaction* overrides personal *jurisaction*."[31] Employing the concept of quasi-territorial jurisdiction, at any one time, means only

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[27] The S.S. Lotus Case (Fr. v. Turk.), Judgment, 1927 P.C.I.J. (ser. A) No. 10,18-19 (Sep. 7).

[28] CHENG, *supra* note 3, at 480. The Law of the Sea precedents and theories have a variety of rules on the allocation of jurisdictional powers especially on the criminal offences committed in foreign ships in internal waters. But conceptually, that is an exception to the principle. *See* D.J. HARRIS, CASES AND MATERIALS ON INTERNATIONAL LAW 429-33 (6th ed. 2004).

[29] *See* JAMES CRAWFORD, BROWNLIE'S PRINCIPLES OF PUBLIC INTERNATIONAL LAW 448 (9th ed. 2012).

[30] CHENG, *supra* note 3, at 479.

[31] *Id.* at 480.

one State would be recognized to exercise jurisdiction to enforce, or *jurisaction*, in respect of a space object operating in outer space and persons onboard, as long as the said space object holds a nationality. That is the exact reason that Professor Cheng asserts the conferral of nationality to a space object is a prerequisite for maintaining legal order of space activities. In the era of private human activities, where persons with various nationalities are onboard a space station owned or operated by another private person, stable hierarchy of *jurisaction* is essential. However, that kind of stable hierarchy is not sufficiently or clearly regulated in the present UN Space Treaties (as discussed in Part IV).

III. NATIONALITY OF SHIPS AND AIRCRAFT

To understand the concept of nationality of space objects, this Part III explores the implications and contents of nationality of ships and aircraft. If the same implications and contents may be found on every space object with a specific State, then it can be safely said that the nationality has been implicitly granted to space objects.

It is true that some differences exist concerning internationally established rules on nationality between ships and aircraft, but in general, more similarities than differences are found between the two. The concept of the nationality of ships evolved as customary international law,[32] while the concept of nationality of aircraft has been established by treaties.[33] Nationality is a means of maintaining navigation safety by identifying the State responsible for and entitled to oversight, control and protection of the activities of ships or aircraft.[34] The conditions to grant nationality remain unchanged since the 1958 Convention on the High Seas.[35] "Ships have the

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[32] VINCENT COGLIATI-BANTZ, MEANS OF TRANSPORTATION AND REGISTRATION OF NATIONALITY 16-17 (2017).

[33] I.H.PH. DIEDERIKS-VERSCHOOR, AN INTRODUCTION TO AIR LAW 17-18 (9th revised ed. 2012).

[34] *See* Richard A. Barnes, *Flag State*, *in* THE OXFORD HANDBOOK OF THE LAW OF THE SEA 304-05 (Donald R. Rothwell et al. eds., 2015); DIEDERIKS-VERSCHOOR, *supra* note 33, at 17.

[35] Convention on the High Seas, Apr. 29, 1958, 450 U.N.T.S.11 [hereinafter Convention on the High Seas].

nationality of the State whose flag they are entitled to fly"[36] and "[e]very State shall fix the conditions for the grant of its nationality to ships, for the registration of ships in its territory, and for the right to fly its flag."[37] Also, "[t]here must exist a genuine link between the State and the ship."[38] This is, at first glance, different from the outright grant of nationality by the registration in case of aircraft. The Convention on International Civil Aviation (Chicago Convention)[39] provides that "[a]ircraft have the nationality of the State in which they are registered."[40] As for the relationship between nationality and registration for ships, some commentators note that registration is not an action to bestow nationality to a ship,[41] but it may only happen that "conferral of nationality and identification may be performed simultaneously by registration."[42] However, other writers assert conferral of nationality and registration are virtually identical.[43]

For both ships and aircraft, national registration is a legal duty, and registration plays an important role for identification of nationality.[44] For example, a flag State shall maintain a register of ships[45] and "[e]very State shall issue to ships to which it has granted the right to fly its flag documents to that effect."[46] Not only civil aircraft, but every aircraft engaged in international air navigation shall carry its certificate of registration and bear its appropriate nationality, registration marks and other relevant

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[36] *Id.* at art. 5(1); United Nations Convention on the Law of the Sea art. 91(1), Apr. 30, 1982, 1833 U.N.T.S. 397 [hereinafter UNCLOS].

[37] *Id.*

[38] Convention on the High Seas, *supra* note 35, art. 5(1); UNCLOS, *supra* note 36, art. 91(1).

[39] Convention on International Civil Aviation, Dec. 7, 1944, 15 U.N.T.S. 295 [hereinafter Chicago Convention].

[40] *Id.* at art. 17.

[41] COGLIATI-BANTZ, *supra* note 32, at 51-58.

[42] *Id.* at 58.

[43] *Id.* at 52. *See also* R.R. CHURCHILL & A.V. LOWE, THE LAW OF THE SEA 257 (3d ed. 1999). Brownlie's Public International Law describes it as "conferment of nationality [registration]" until its eighth edition, and its ninth edition is written as "[c]onferring nationality [by registration]." *See* CRAWFORD, *supra* note 29, at 515. In any case, it is seen as the same thing.

[44] COGLIATI-BANTZ, *supra* note 32, at 58-59.

[45] UNCLOS, *supra* note 36, art. 94(2)(a).

[46] *Id.* at art. 91(2).

documents.[47] Further, information on registration and ownership of any particular aircraft registered in that State shall be furnished to other Contracting States or to the International Civil Aviation Organization (ICAO) on demand.[48]

Ships shall sail under the flag of only one State but the transfer of ownership or change of registry is possible.[49] Likewise, an aircraft shall be registered in only one State while transfer of registration is possible,[50] and conditions of registration and its transfer are determined by national laws and regulations.[51] For aircraft, as transfer of the functions of the State of registry to another State is permissible, registration does not necessarily correspond to jurisdiction and control exercised over the aircraft.[52]

The difference of the nationality concept between ships and aircraft may the necessity of a "genuine link." While a genuine link is required between the flag State and a ship as mentioned above, such requirement is not provided in the Chicago Convention for aircraft. But in reality, it seems unclear if any substantial difference exists or not. With respect to a ship, the definition, contents or conditions of a genuine link are not enumerated in the UN Convention on the Law of the Sea (UNCLOS),[53] thus they are left to national legislation.[54] However, the contents of effective jurisdiction a flag State shall exercise are provided in a concrete and detailed manner in the UNCLOS.[55] Hence, fulfilling the obligations of a flag State to secure effective implementation of the duties elaborated in the

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[47] Chicago Convention, *supra* note 39, arts. 20-21, 29, 31-34. Therefore, while State aircraft does not necessarily have to be registered for the purposes of nationality, for the sake of carrying a certificate, they are also registered. *Id.* at art. 3(a).

[48] *Id.* at art. 21.

[49] UNCLOS, *supra* note 36, art. 92. 3 UNITED NATIONS CONVENTION ON THE LAW OF THE SEA 1982: A COMMENTARY, 122-27 (Satya N. Nandan & Shabtai Rosenne eds., 1995).

[50] Chicago Convention, *supra* note 39, art. 18.

[51] *Id.* at art. 19.

[52] *Id.* at art. 83bis.

[53] UNCLOS, *supra* note 36, art. 91(1).

[54] Nandan & Rosenne, *supra* note 49, at 106; Barnes, *supra* note 34, at 306-10.

[55] UNCLOS, *supra* note 36, art. 94. Articles 5(1) and 10 of the Convention on the High Seas developed into the more detailed and concrete Article 94 of the UNCLOS. The contents of effective jurisdiction specified in Article 94 include not only maintaining a register of ships and assuming jurisdiction on each ship flying its flag, its master, officers and crew concerning administrative, technical and social matters, but also taking measures to ensure safety at sea with regard to the construction and seaworthiness of ships, the manning of ships, labor conditions, training of crews and the maintenance of communications.

UNCLOS would automatically meet the criterion of a genuine link between the State and a ship.[56] Before introducing the concept of a genuine link to the 1958 Convention on the High Seas, which was influenced by the *Nottebohm Case* (1955),[57] practice of the "flag of convenience" was already embedded in granting nationality to ships. Thus, the reasonably possible solution must have been to place a flag State under the obligation to maintain effective jurisdiction and control over ships.

With respect to registering aircraft, some commentators suggest that a genuine link is not required.[58] This may be supported by the above-mentioned fact that the transfer of the functions of the State of registry to another State is permissible, and that registration does not necessarily correspond to jurisdiction and control over aircraft. This was brought about by the amendment of the Chicago Convention in 1980 that was used to accommodate the business necessity caused by the increased lease, charter or interchange of the aircraft whose operator is outside the State of registry.[59] The discrepancy between the nationality (registration) and jurisdiction and control is opposable to other States only when the transfer of functions and duties are registered with the Council of the ICAO or that information is furnished to other States. This is another public notice mechanism to identify which State is responsible for, and entitled to, a certain aircraft.[60] Other commentators regard the requirement of genuine link as implied in the Chicago Convention, for the State of registry has an obligation to ensure that its national aircraft will observe its international and national rules of air safety and navigation.[61] Besides, State practice shows that an aircraft is, in most cases, registered in the national State of its owner, and therefore, the genuine link is substantially established.[62] The

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[56] Nandan & Rosenne, *supra* note 49, at 143-52. *See also* M/V Saiga (No. 2) (St. Vincent v. Guinea), Case No. 2, Judgment of July 1,1999, at 42 ⁋ 83.

[57] Nottebohm Case (Liech. v. Guat.), 1955 I.C.J. Rep. 4 (Apr. 6).

[58] *See, e.g.,* Vincent P. Cogliati-Bantz, *Disentangling the Genuine Link: Enquiries in Sea, Air and Space Law,* 79(3) NORDIC J. INT'L L. 383, 417-8 (2010).

[59] Chicago Convention, *supra* note 39, art. 83*bis*.

[60] *Id. See also* CHENG, *supra* note 3, at 482, 485.

[61] Chicago Convention, *supra* note 39, Preamble; COGLIATI-BANTZ, *supra* note 32, at 70-71.

[62] *See e.g.*, The Air Navigation Order 2016, SI 2016/765, arts. 24, 26 (Eng.);49 USC § 44102 (a).

latter view would be more convincing considering the compromised solution of the ship required to recognize a genuine link.

As much as a ship enjoys genuine link with the flag State, so does aircraft with the State of registry. Both have business interests, and even necessity, which would influence and distort the selection of national State or the State to exercise jurisdiction and control. However, increased development of international law for transportation safety forces States to maintain effective jurisdiction and control over all means of cross border transportation. Assumption of such international responsibility plays the role of preventing an unacceptable degree of use of flags of convenience.

In respect of the question whether ships can sail under the flag of IGOs, UNCLOS provides that ships employed on the official services of the UN, its specialized agencies and the International Atomic Energy Agency (IAEA) may fly the flag of the organization.[63] This is a provision "to insulate the ship from the application of national rules incompatible with the United Nations obligations."[64] Some commentators consider that "[t]he exact meaning of this provision is not really clear, but it would seem to leave the question open."[65] It could be inferred, however, that some IGOs may exercise the quasi-, or functional jurisdiction, and control over ships while the concept of jurisdiction is inherently limited to the territorial principle. As for aircraft, there are conflicting views as to whether some kinds of international organizations, but not necessarily IGOs, may register aircraft as their operation is possible. This remains unclear, but it is clear that the ICAO Council will determine the rules relating to nationality of the aircraft operated by such an international organization. [66]

In summary, for both ships and aircraft: (i) nationality is conferred by registration by a State which has a genuine link; (ii) contents of genuine link is determined by respective national laws (domestic jurisdiction); (iii) the national States of the ship and aircraft are under the duty to exercise effective jurisdiction and control for maintaining navigation safety and the contents of effective

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[63] UNCLOS, *supra* note 36, art. 93.

[64] Nandan & Rosenne, *supra* note 49, at 134.

[65] CHURCHILL & LOWE, *supra* note 43, at 262.

[66] Chicago Convention, *supra* note 39, art. 77; COGLIATI-BANTZ, *supra* note 32, at 116-32.

jurisdiction and control are enumerated in the UNCLOS and the Chicago Convention; (iv) the methods of identification of nationality are specified clearly in the UNCLOS and Chicago Convention; and (v) the function of International Organizations to fly its flag or operate of ships or aircraft is approved to the extent that it is provided for in the relevant international agreements.

The points confirmed above could be used to assess if space objects may also be conferred nationality by a specific State. If points (i) to (v) above are shared by a specific State and the space object, it may seem to follow that nationality has already been implicitly accorded to space objects. These points will be studied in Part V.B.

IV. FUNCTIONS OF REGISTRATION UNDER THE REGISTRATION CONVENTION

A. Professor Bin Cheng's Concerns: Registration as an Unstable Link

Professor Cheng expressed concerns on the jurisdictional basis in the UN Space Treaties including, especially the possibility that *jurisaction* would be allocated to a State which is neither willing nor capable in exercising it.[67] First, Cheng pointed out that "registration" chosen as a legal link between a State and space object is not necessarily a stable one for a State to exercise jurisdiction and control over space objects due to an optional clause provided in Article II (2) of the Registration Convention.[68] The first sentence of Article VIII of the Outer Space Treaty provides that "[a] State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body."[69]

Article II of the Registration Convention provides:

> 1. When a space object is launched into Earth orbit or beyond, the launching State shall register the space object by means of an entry in an appropriate registry which it shall maintain.

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[67] *See generally* CHENG, *supra* note 3, at 482-84.

[68] *Id*.

[69] Outer Space Treaty, *supra* note 5, art. VIII.

> Each launching State shall inform the Secretary-General of the United Nations of the establishment of such a registry.
>
> 2. Where there are two or more launching States in respect of any such space object, they shall jointly determine which one of them shall register the object in accordance with paragraph 1 of this article, bearing in mind the provisions of article VIII 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, and without prejudice to appropriate agreements concluded or to be concluded among the launching States on jurisdiction and control over the space object and over any personnel thereof.
>
> 3. The contents of each registry and the conditions under which it is maintained shall be determined by the State of registry concerned.

The Registration Convention also obliges: (i) each State of registry to furnish registration information specified in Article IV (1) to the UN Secretary-General (UN Registration); and (ii) the UN Secretary-General to maintain such registry fully and openly accessible.[70] These provisions make it clear that it is compulsory national registration which produces jurisdiction and control over a space object, not UN Registration. Thus, State of registry pursuant to the Outer Space Treaty shall exercise jurisdiction and control over a space object, but another State, while yet among one of the launching States,[71] may also do so in accordance with Article II (2) of the Registration Convention, as launching States seem to "need only to 'bear in mind' Article VIII of the Space Treaty"[72] when they conclude appropriate agreements to cut the link between registration and resultant jurisdiction and control. Professor Cheng refers to this as "the equivalent of 'flags of convenience' in space."'[73] Closely entwined with the first point above, Professor Cheng stated the lack of a public notice mechanism of "appropriate agreements"

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[70] Registration Convention, *supra* note 6, art. III.

[71] The term "launching State" is defined as (i) a State which launches or procures the launching of a space object or (ii)a State from whose territory or facility a space object is launched. Liability Convention, *supra* note 6, art. I(c); Registration Convention, *supra* note 6, art. I(a).

[72] CHENG, *supra* note 3, at 484.

[73] *Id.* at 485.

in Article II (2) of the Registration Convention would lead to the situation that other States Parties do not have knowledge that a State other than the State of registry is exercising jurisdiction and control over a certain space object.[74] He suggested the introduction of a public notice system modelled by the amendment of the Chicago Convention in 1980 mentioned above.[75]

In summary, Professor Cheng pointed out that the possible discrepancy between registration and jurisdiction over a space object without a public notice can easily mislead third parties, and thus "Article VIII of the Space Treaty loses all credibility in all cases of joint launching."[76] Hence, he recommends some modifications to Article VIII of the Outer Space Treaty and the Registration Convention, through which nationality is granted to space objects in a manner that uncertain hierarchy of *jurisaction* and unstable function of the registration as a link will be mended.[77] In this regard, a significant problem may be posed by the unique responsibility rule under Article VI of the Outer Space Treaty, for the scope of "national activities in outer space" is not uniformly understood by States Parties.[78] This point is considered in detail in Part V.C. of this article.

In addition, without nationality, two more uncertainties may prevail, because the phrase "over such object, and over any personnel thereof"[79] in Article VIII of the Outer Space Treaty will not guarantee the secured quasi-territorial jurisdiction even between States Parties to the Treaty. The first uncertainty is that the personnel who were originally in space object "A" registered by State "X" would still be under the jurisdiction of State "X," even if the personnel had moved and stayed in a space object "B" registered by State "Y." This would hinder the maintenance of the safety and security of the self-contained community of space object "B" for which

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[74] *Id.*

[75] *Id.* at 482, 485.Chicago Convention, *supra* note 39, art. 83bis.

[76] CHENG, *supra* note 3, at 485.

[77] *Id.* at 482, 490-91.

[78] *Id.* at 486-88.

[79] It is understood that the change of the word from "therein" as found in the Resolution which served as a precursor to the Outer Space Treaty (G.A. Res. 1962 (XVIII), ¶ 7 (Dec. 13, 1963)) to the present "thereof" in the Outer Space Treaty made it clear that personnel outside the said space object will be under the jurisdiction and control of the State of registry of that space object. *See* CHENG, *supra* note 3, at 458-59.

State "Y" is responsible.[80] Second, within the same phrase, "personnel" may be narrowly interpreted in a manner that other kinds of persons (e.g. "passengers") are not included, which would place persons other than personnel under an unclear legal situation.[81]

Further, the criterion of "ownership" introduced by the Moon Agreement as a legal link to exercise jurisdiction and control is noted as a source of confusion in the legal order of space activities.[82] The Moon Agreement does not refer to registration, but provides that "States Parties shall retain jurisdiction and control over their personnel, vehicles, equipment, facilities, stations and installations on the Moon."[83] This could be problematic in theory, but noting that only 18 States are Parties to the Moon Agreement as of 2020,[84] the present author thinks this would not become a serious concern and therefore no further mention is made to the Moon Agreement in this article.[85]

B. Nationality Not Conferred to Space Objects

This subsection briefly touches upon whether or not the intention to confer nationality to space objects existed when the Registration Convention was drafted. As with any other treaty, the Registration Convention was made as a compromise among States having differing views. The purposes pursued in the negotiation phase of the Registration Convention included: providing means and procedures for the identification of space objects for the safe operation

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[80] *Id.* at 488.

[81] *Id.*

[82] Moon Agreement, *supra* note 6, art. 12(1).

[83] *Id.*

[84] Comm. on the Peaceful Use of Outer Space, Legal Subcomm., *Status of International Agreements Relating to Activities in Outer Space as at 1 January 2019*, U.N. Doc. A/AC.105/C.2/2019/CRP.3, at 10 (Apr. 1, 2019).

[85] Likewise, the present author would not refer to the 1988 International Space Station Agreement, as it seems that the Professor Cheng's concern about the modification of the jurisdictional basis by the special agreement (e.g., Article 22 (criminal jurisdiction) of the 1988 International Space Station Agreement) would not introduce serious consequences, for this is a governmental scientific cooperation agreement. The problems may be recognized if private space stations are operated without the existence of quasi-territorial jurisdiction. *See* Agreement Concerning Cooperation on the Civil International Space Station art. 22, Jan. 29, 1998, T.I.A.S. 12927.

of outer space;[86] establishing a central register of space objects for the same purpose;[87] and establishing a national register traditionally found in the maritime, air and road traffic with corresponding marking systems that is accessible to the public.[88]

An early French proposal for the Registration Convention had substantial resemblance to the mechanisms conferring nationality to aircraft described in the Chicago Convention in that: (i) national registration is legally obligatory;[89] (ii) conditions to register a space object is determined by each State Party;[90] (iii) only one State may register a space object;[91] (iv) transfer of registration is permissible;[92] (v) there shall be an accessible national register which contain highly standard particulars of each object;[93] and (vi) each space object shall carry standardized designator and registration number demonstrating the State of registry.[94] The United States (US) reacted to the French proposal by stating:

> The purpose of the French proposal — was to place on record the *nationality of objects* launched into outer space, using the term "registry" as it was used in article VIII of the 1967 Treaty . . . . The purpose of the French proposal was apparently to provide a method of identifying the owner of a particular object after its return to earth, especially in cases where damage was caused by the object . . . . The French proposal attempted to establish such a system by linking numerical designations marked on space objects to entries in open national registers. The idea itself was a valid one, but his country had serious

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[86] Registration Convention, *supra* note 6, Preamble ¶ 8. *See* Comm. on the Peaceful Uses of Outer Space, Rep. of Legal Subcomm., U.N. Doc. A/AC.105/C.2/L.85 (Mar. 19, 1973).

[87] Registration Convention, *supra* note 6, Preamble, ¶ 7. *See* Comm. on the Peaceful Uses of Outer Space, Rep. of Legal Subcomm., U.N. Doc. A/AC.105/C.2/L.82, (Apr. 4, 1972).

[88] Comm. on the Peaceful Uses of Outer Space, Rep. of Legal Subcomm., U.N. Doc. A/AC.105/C.2/L.45, arts. 1-3 (June 18, 1968) (French proposal).

[89] *Id.* at art. 1.

[90] *Id.* at art. 2.

[91] *Id.* at art. 1.

[92] *Id.*

[93] *Id.* at art. 2.

[94] *Id.* at art. 3.

> doubts as to the technical feasibility of the proposal as it stood (emphasis added).[95]

The technical aspects of the registration of space objects was studied by COPUOS partly as a comparative study of the registration systems of the aircraft, ships, radio frequencies and "designation of satellites and space probes."[96] This information was respectively furnished by the ICAO, International Maritime Consultative Organization (IMCO) (presently International Maritime Organization (IMO)), International Telecommunication Union (ITU) and Committee on Space Research (COSPAR).[97] This study seemed to show that the idea of granting nationality to space objects was not altogether dismissed during the negotiation of the Registration Convention, but the reality was that the later discussions and proposals rather focused on technically feasible and economically effective registration systems for identifying a space object in case of an accident, especially on the ground.[98]

As national registration generates jurisdiction, and then possibly nationality, to space objects, some kind of national registry as detailed and open as the level of ships or aircraft together with the clear identification system of space objects is needed. But the present Registration Convention seems to have failed to meet such criteria. The Registration Convention, as currently adopted, does not provide the open and free national register that includes full information of a space object including its owner and operator. Although information furnished by the State of registry to the UN Register is

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[95] Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., 8th Sess., 112th mtg., at 13, U.N. Doc. A/AC.105/C.2/SR.112 (June 11, 1969). This statement is also incorporated in Comm. on the Peaceful Uses of Outer Space, Sci. & Tech. Subcomm., 7th Sess., at 9, U.N. Doc. A/AC.105/L.52 (Apr. 14, 1970). However, in this iteration the expression of the US statement is slightly but not substantially different.

[96] A/AC.105/L.52, *supra* note 95, at 45.

[97] *Id.,* at 14-47.

[98] *See, e.g.*, Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., 8th Sess., 111th-121st mtgs., U.N. Doc. A/AC.105/C.2/SR.115 (June 13, 1969); Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., *Registration with the United Nations of Objects Launched into Outer Space*, U.N. Doc. A/AC.105/C.2/6 (June 27, 1969); Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Twelfth Session, U.N, Doc. A/AC.105/115, at Annex II (1973) (describing various proposals). *See also* Charles Dalfen, *Toward an International Convention on the Registration of Space Objects: The Gestation Process*, 9 CANADIAN Y.B. INT'L L. 252-68(1971).

subject to full and open access,[99] and international cooperation is planned for the identification of the space object which caused damage,[100] it is a ship- or aircraft-level national registry which leads to the clarification of the rights and duties of the State of registry. Consequently, the resultant effect of nationality is not conferred to a space object.

However, the following point would not create an obstacle to the future possibility of recognizing nationality on space objects. The Registration Convention makes it clear that an IGO which conducts space activities may register a space object granting that such IGO declares its acceptance of the rights and obligations provided in the Registration Convention, so long as majority members of that IGO are the States Parties to the Registration Convention and the Outer Space Treaty.[101] It is not required to conclude an appropriate agreement between an IGO and a member State to determine the State exercising jurisdiction and control over a space object. It follows that an IGO may also exercise jurisdiction and control over a space object and any personnel thereof.[102] In view of the conferral of nationality to a space object, conceptually, this may be an obstacle. However, noting the example of the ship flying the flag of the UN, etc.,[103] the jurisdiction and control exercised by IGOs could be duly accepted in accordance with the Registration Convention, especially because IGOs concerned are qualified by the strict conditions mentioned above and when some inconvenience may be envisioned, an appropriate agreement may be concluded with a certain State which is to exercise jurisdiction and control pursuant to Article II (2) of the Registration Convention.[104]

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[99] Registration Convention, *supra* note 6, arts. III-V.

[100] *Id.* at art. VI.

[101] *Id.* at art. VII(1).

[102] Because the Rescue Agreement, the Liability Convention and the Moon Agreement also grant a same category of status to the IGO relating to the respective treaty, the rights and obligations provided in either treaty is applicable to a qualified IGO mutatis mutandis.

[103] UNCLOS, *supra* note 36, art. 93.

[104] As of September 2020, only four IGOs have declared acceptance of rights and obligations of the two or three of the UN Space Treaties, and only the European Space Agency (ESA) and European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) have carried out UN registration. A/AC.105/C.2/2019/CRP.3, *supra* note 84, at 10.

V. EFFORTS TO FIND THE GENUINE LINK WITH A SPACE OBJECT

A. Practice Developed through Transfer of Ownership or Control of Satellites

i. Early Examples

Discrepancy between registration and jurisdiction without a public notice seems to be typically brought about through an on-orbit transfer of ownership or control of satellites.[105] Among many examples found to date, only a small number of cases are transactions between launching States which would be fit under Article II (2) of the Registration Convention. One example is a private Filipino company's satellite, Agila-2, launched from China in 1997 and registered by the Philippines. While in orbit, Agila-2 was purchased by a Hong Kong-based Chinese company in 2009.[106] Registration was not changed and the Philippines-based ground facility continued telemetry, tracking and command (TT&C) service for the satellite.[107]

Another example is not a typical on-orbit transfer of ownership of a satellite. Rather, it is the change of nationality of the operators of satellites due to territorial transfer, which prompted governmental cooperation to change the State of registry. With the return of Hong Kong from the United Kingdom (UK) to China on July 1, 1997, the State of registry was changed from the UK to China in respect of four satellites, all of which had been launched from China. Since this was conducted by the UK's removal of registration from the UN Register and China's new UN registration of those satellites on the same day, the public notice was appropriately

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[105] *See* OWNERSHIP OF SATELLITES (Mahulena Hofmann & Andrea Loukakis eds., 2017); Mark J. Sundahl, *Legal Status of Spacecraft*, *in* ROUTLEDGE HANDBOOK OF SPACE LAW 45-46 (2017).

[106] The Philippines registered Agila-2 in accordance with G.A. Res. 1721B (XVI), ¶ 1 2(Dec. 20, 1961). Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with General Assemble Resolution 1721 B (XVI) by States Launching Objects into Orbit or Beyond*, A/AC.105/INF.409, at 2 (May 2, 2003). Agila-2 was renamed first as ABS-5 in 2009 and then ABS-3 in 2011.

[107] Press Release, Asia Broadcast Satellite, Asia Broadcast Satellite to Acquire Mabhay Satellite Corporation (Nov. 6, 2009), https://www.absatellite.com/asia-broadcast-satellite-to-acquire-mabuhay-satellite-corporation/.

conducted on the change of the State of registry.[108] Arguably, this is the only case when there was no discrepancy between State of registry and the State to exercise jurisdiction and control through the change of State of registry.

No reference is made if transfer of registration is legal in either the Outer Space Treaty or the Registration Convention, but the present author is of the view that transfer of registration among launching States seems to be implicitly approved of in accordance with Article II (2) of the Registration Convention. The legality of the transfer of registration from a launching State to a non-launching State remains unclear. The view is expressed that it is legal to transfer jurisdiction to non-launching State when all launching States agree such transfer.[109]

In this regard, there is arguably only one such transfer of registration from the launching State to a non-launching State, which is found as an early example. A private company from the UK procured the launch of its geostationary (GEO) satellite from US territory in August 1989 and the UK registered that satellite, BSB-1A, in the UN Register in April 1990.[110] Then, BSB-1A was sold to a

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[108] *See* Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/222, at 2 (Aug. 29, 1990) (registration of AsiaSat-1 launched in April 1990); Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/300, at 1-2 (Feb. 1, 1996) (registration of APSTAR-I launched in July 1994 and AsiaSat-2 launched in November 1995); Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/316, at 2 (Oct. 31, 1996) (registration of APSTAR-IA launched in July 1996). Notification of the removal of the abovementioned four satellites from the UK National Register was effective July 1, 1997. Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/333 (Apr. 3, 1998). China notified the addition of above-mentioned satellites to the register of the Hong Kong Special Administrative Region of China, effective July 1, 1997. Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/334 (Apr. 3, 1998).

[109] *See* e.g., Kai-Uwe Hörl & Julian Hermida, *Change of Ownership, Change of Registry? Which Objects To Register, What Data To Be Furnished, When, and Until When?*, *in* SPACE LAW 266-67 (Francis Lyall & Paul B. Larsen eds., 2007).

[110] Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.R/219, at 5 (Apr. 24, 1990). At that time, UK practice was that the name of

Swedish company in 1996. Sweden registered that satellite, renamed as Sirius 1, in the UN Register when all the operations of the former BSB-1A were transferred to a Swedish company in February, 1999.[111] Unlike the later day practice, the UK did not furnish the information of the removal of BSB-1A from the UK Registry of Outer Space Objects (UK National Registry) [112] to the UN Secretary-General. The UK only transferred BSB-1A from the formal UK National Registry to the UK Supplementary Registry of Outer Space Objects (UK Supplementary Registry).[113] Both registries are available for open and free access on the internet. Notably, Sweden transmitted information to the UN Register again the next year in order to report that the launching State was the US.[114] Presumably, Sweden considered it necessary to declare that it did not recognize itself as a procuring launching State by reason of registration.[115] It was the UK that furnished additional information of the eventual end of the mission re-orbit of Sirius 1 in 2007.[116] It is the

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the launching State was not specified in the registration form. Instead, the owner or operator was specified. Thus, no reference of the launching State does not mean that the UK does not regard itself a launching State.

111 Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/352, at 3 (Feb. 19, 1999). Sweden did not specify the name of the launching State and added the information that former BSB-1A, renamed as Sirius 1, was bought in orbit in 1996. *Id.*

112 U.K. SPACE AGENCY, U.K. REGISTRY OF OUTER SPACE OBJECTS (Oct. 2020), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/925088/UK_Registry_of_Space_Objects_October_2020.pdf. [hereinafter UK NATIONAL REGISTRY].

113 U.K. SPACE AGENCY, U.K. SUPPLEMENTARY REGISTRY OF OUTER SPACE OBJECTS (Oct. 2020), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/925089/UK_Supplementary_Registry_of_Space_Objects_-_October_2020.pdf [hereinafter UK SUPPLEMENTARY REGISTRY]. The date accepted onto the UK Supplementary Registry is specified as April 4, 1990; that appears to be the date where BSB-1 was registered in the UK National Registry before its information furnished to the UN Register.

114 Sweden transmitted "new information" concerning Sirius 1 to the UN Secretary-General, which stated that the US was a launching State of Sirius 1 (formerly BSB-1A), which was launched from the US territory in August 1989. Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/377, at 1-2 (Oct. 24, 2000).

115 *See* Registration Convention, *supra* note 6, art. I(c).

116 Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/518, at 3 (Sept. 6, 2007). The UK used BSB-1's other name, "MarcoPolo 1."

duty of the State of registry to notify the UN Secretary-General that a space object registered by it is no longer in Earth orbit.[117] In this case the new State of registry, Sweden, did not fulfill that responsibility, rather the old State of registry, the UK, fulfilled that responsibility. Coherent explanation is difficult in this early case concerning the function of the transfer of registration. No transfer of registration from a launching State to non-launching State is confirmed after the BSB-1/Sirius 1 case.

In most cases, transfers of ownership or control of satellites have taken place between a launching State and a non-launching State, or between the two non-launching States.[118] There are cases where it is unclear, at least from the third party point of view, if the national State of a transferor recognizes itself as a launching State due to the lack of the UN registration, which is available to public access and, therefore, is often used as a criterion to determine if a specific State is the State of registry, rather than the national registry.

ii. UK Practice Established by the First Decade of the 21st Century

With regards to the nationality of a space object, the present author is of the view that the UK seems to have established a criterion to be the State conferring nationality to satellites (spacecraft) among space objects in the first decade of the 21st century. A few interesting examples which may support this view are described below. The reason that the UK practice is specifically mentioned here is that the British logic applying the UN Space Treaties is much more clear than other States' reasoning because of its transparent registration system, both national and within the UN. In addition, the UK is in advantageous position to present a criterion to be a procuring launching State because it has national space legislation and does not have a launching site.

One of the first examples is the GE Satcom-1A satellite of GE Capital Satellites (Gibraltar) Ltd. case. GE Satcom-1A was launched from Baikonur, Kazakhstan on October 1, 2000 and

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[117] Registration Convention, *supra* note 6, art. IV(3).

[118] *See* Frans von der Dunk, *Transfer of Ownership in Orbit: From Fiction to Problem*, *in* OWNERSHIP OF SATELLITES 29-43 (2017).

accepted in the UK National Registry on October 12, 2000,[119] before it was registered in the UN Register in accordance with Article IV of the Registration Convention in November 2000.[120] A year later, the UK furnished information to the UN to withdraw its previous registration stating that the UK "would like to clarify the registration information for the GE-SATOCOM-1A (International designation 2000-059A) satellite . . . . The Gibraltar incorporated company GE Capital Satellite (Gibraltar) Ltd. did not procure the launch of the space object and thus the United Kingdom is not 'State of registry.'"[121] When the UK found that GE Capital Satellites (Gibraltar) was a subsidiary of a US company, GE American Communications (GE Americom) and the latter exercised effective control over the business plan and operation of GE-SATCOM-1, the UK understood that it was not a procuring launching State as no genuine link existed between the UK and GE-SATCOM-1A satellite. Therefore, GE-SATCOM-1A was transferred from the UK National Registry to the UK Supplementary Registry.[122] Before the UK withdrew the registration from the UN Register, the US registered the same satellite 2000-059A (satellite name was not specified by the US) in the UN Register.[123]

The UK Space Agency carries space objects in the UK Supplementary Registry when the UK is: "(i) not a 'launching state' for the relevant space object, or (ii) where it was jointly determined that another 'launching state' should register the relevant space object."[124] When a private UK company is granted a license to procure the launch of a satellite under the UK Outer Space Act,[125] the UK usually recognizes itself as a procuring launching State and when

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[119] It has recently been transferred to the UK SUPPLEMENTARY REGISTRY, *supra* note 113, at 68. GE SATCOM-1A's previous status in the UK is cited as a satellite that was "removed from UN Register in ST/SG/SER.E/389" in 2001. *See infra* note 121.

[120] Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer* Space, U.N. Doc., ST/SG/SER.E/378, at 1, 8 (Nov. 6, 2000).

[121] Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer* Space, U.N. Doc. ST/SG/SER.E/389, at 1 (Mar. 28, 2001).

[122] UK SUPPLEMENTARY REGISTRY, *supra* note 113, at 68.

[123] Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/385, at 4 (Feb. 1, 2001).

[124] UK SUPPLEMENTARY REGISTRY, *supra* note 113, at 3.

[125] Outer Space Act 1986, c. 38 (Eng.).

its national operates the said satellite, it becomes the State of registry. However, if a UK national which obtained a launch license does not have the effective control of the said space object, either because it is a subsidiary lacking in business authority, which is in the hand of a parent company located in a foreign State,[126] or a UK national company that is a manufacturer or operator of a satellite, transfers its in-orbit operation to a foreign company when the satellite is placed into orbit and initial necessary experiments are finished,[127] the UK does not regard itself as a procuring launching State because it does not have a genuine link with the space object concerned and, accordingly, does not become a State of registry. As of October 2020, 69 satellites are carried in the UK Supplementary

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[126] Another example is the case that UK company is a subsidiary of the Swedish company which has control over a satellite launched by the authorization of the UK Outer Space Act. SES Satellite Leasing Ltd (Isle of Man), obtained an authorization of the launch of a GEO satellite, Sirius-4, under the UK Outer Space Act, but a Swedish company, NSAB, controlled SES Satellite Leasing Ltd., and therefore, it had effective control over Sirius-4. Sweden became the State of registry. Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/532, at 2 (Feb. 29, 2008). The UK put Sirius-4 in its Supplementary Registry in November 2007 on the same day when the license to launch a satellite was granted. Later, the UK furnished information of Sirius-4 to the UN describing the UK "authorized launch only. Sweden has registered in-orbit operation." Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/554, at 2 (Nov. 3, 2009). A year later, the UK furnished another information to the UN stating "Remove the United Kingdom as State of registry. This space object is registered by Sweden." Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/594, at 3 (Dec. 8, 2010). The information submission in 2009 already indicated reservation stating that the UK "authorized launch only" and it seems peculiar that the UK declared it had removed itself as State of registry in 2010. This seems to show the uncertain demarcation between furnishing information to the UN as the UN registration and furnishing information to the UN just for the sake of providing information for the identification of space object. See UK SUPPLEMENTARY REGISTRY, *supra* note 113, at 32.

[127] UK national, Surrey Satellite Technology Ltd. (SSTL), made Deimos-1 for a Spanish company and obtained a launch license under the UK Outer Space Act in 2009. Deimos-1 was launched from Russia and Spain did not register it. As Deimos-1 was owned and operated by a Spanish national, the UK furnished information to the UN Register stating that the UK "authorized launch only. Spain to register in-orbit operation." Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/575, at 2 (Nov. 4, 2009). UK placed Deimos-1 in the UK Supplementary Registry. UK SUPPLEMENTARY REGISTRY, *supra* note 113, at 33.

Registry[128] and in respect of those satellites, mere information has been provided to the UN Secretary-General in a manner that should not be misunderstood as a normal UN registration based on national registration. However, it was not always easy to distinguish the two, partly because any information provision had been conducted in accordance with Article IV of the Registration Convention. British practice certainly played a role for the UN Office for the Outer Space Affairs (UNOOSA) to prepare for a variant of information furnishing category of the "Notification Under Article XI of the Outer Space Treaty."[129] This is responsible behavior, in that, the UK provides useful information to the public in respect of a specific space object including the owner or operator of a satellite even if the State of registry and the procuring launching State remain uncertain. Identifying the owner and operator is an important factor to determine the State to grant nationality to ships and aircraft (as discussed in Part III.).

B. UNGA Resolutions Contributing to Finding Genuine Link

With increased private procurement of space launch services, identifying all launching States in one launch has come to be more difficult. Currently, there is no universal agreement as to whether a State whose non-governmental entity owns or operates a satellite by way of the service of a foreign launch provider should be regarded as a procuring launching State.[130] UNGA resolution "Application of the Concept of the 'Launching States'" adopted in 2004,[131] did not address this issue, but it pursued alleviating the problems

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[128] UK SUPPLEMENTARY REGISTRY, *supra* note 113.

[129] *See* Comm. on the Peaceful Uses of Outer Space, *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, U.N. Doc. ST/SG/SER.E/417/Rev.1 (Dec. 3, 2002). The Netherlands also started this practice in 2003 and is the most frequent user of this type of information provision. Comm. on the Peaceful Uses of Outer Space, *Note Verbale Dated 29 July 2003 from the Permanent Mission of the Netherlands to the United Nations (Vienna) Addressed to the Secretary-General*, U.N. Doc. A/AC.105/806 (Aug. 22, 2003).

[130] State practice indicates this tendency when it comes to the operation of GEO communication satellites by large companies. *See United Nations Register of Objects Launched into Outer Space*, U.N. OFF. OUTER SPACE AFF., https://www.unoosa.org/oosa/en/spaceobjectregister/submissions/states-organisations.html [hereinafter UN Register of Objects Launched into Outer Space] (last visited Nov. 20, 2020).

[131] G.A. Res. 59/115 (Dec. 10, 2004).

by urging States to submit information "on their current practices regarding on-orbit transfer of ownership of space objects"[132] and to harmonize their practices.[133] The most optimistic possibility is that a voluntary based public notice system in case of the discrepancy between the State of registry and the State to exercise jurisdiction would be established, which would be tantamount to the 1980 amendment to the Chicago Convention with respect to the transfer of the function of the registering State (as discussed in Part III).

An increased ratio of non-registered satellites, at least with respect to the UN Register[134] led the Legal Subcommittee (LSC) of UN COPUOS to discuss "Practice of States and International Organizations in Registering Space Objects" from 2004 to 2007.[135] These discussions successfully produced the 2007 UNGA Resolution titled "Recommendations on Enhancing the Practice of States and International Intergovernmental Organizations in Registering Space Object" [136] (Registration Practice Recommendations). Facing the difficulty in finding a State to register a satellite, due, in part, to the difficulty in identifying the procuring launching State, the Registration Practice Recommendations provides that in case of joint launches: (i) each space object should be registered separately;[137] (ii) the launching State from whose territory or facility a space object is launched is either to make a prior agreement with a procuring launching State, or to contact States that may be ready to be the procuring launching States and jointly determine the procuring launching State,[138] or recommend its launch service providers to advise their customers, i.e. the owner or operator of a

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[132] *Id.* ¶3

[133] *Id.* ¶4.

[134] The UN survey found that 94.7 percent of the satellites launched were registered in the UN registry in 1992, but registration decreased to 69.5 percent in 2004. Comm. on the Peaceful Uses of Outer space, Legal Subcomm., *Registration Statistics 1957-2004*, U.N. Doc. A/AC.105/C.2/2005/CRP.10, at 1-2 (Apr. 14, 2005).

[135] *See e.g.*, Kai-Uwe Schrogl & Niklas Hedman, *The Results of the UNCOPUOS Legal Subcommittee Working Group on Practice of States and International Intergovernmental Organizations in Registering Space Objects*, 50 PROC. COLLOQUIUM L. OUTER SPACE 514-25(2008).

[136] Registration Practice Recommendations, *supra* note 2. For commentary on this resolution, *see* 3 COLOGNE COMMENTARY ON SPACE LAW, 401-81 (Stephan Hobe et al. eds., 2015).

[137] Registration Practice Recommendations, *supra* note 2, ¶ 3(c).

[138] *Id.* ¶ 3(b).

satellite, to address the appropriate States to register that satellite;[139] and iii) "space objects should be included—-in the appropriate registry of the State responsible for the operation of the space object under Article VI of the Outer Space Treaty."[140]

This Recommendations seems to imply that a State responsible for its "national activities in outer space"[141] under Article VI of the Outer Space Treaty could be qualified as a proxy for a launching State if the procedures outlined above in (i) and (ii) do not result in the identification of the procuring launching State. Procedure (iii) would be used only for States responsible for the operation of satellites, as it is usually easy to identify the State to register launch vehicles and parts thereof. The problem is that there might be plural candidate States for which the operation of that satellite may qualify as "national activities in outer space." The reasons include that the scope of "national activities (in outer space)" depends on the policy decision of the each State, and that is reflected in the scope of national jurisdiction in the space activities acts.[142] Since some States' national acts employ the strict territorial principle, a satellite launched outside its territory may not be its "national activities in outer space" unless, e.g., ground facility for the TT&C is located in its territory.[143] The device of "national activities in outer space" was thus included in the sources of concerns for the stable order of space utilization by Professor Cheng.[144] The further difficulty exists, for a non-governmental entity as "national" may be a multinational company or have a nationality of convenience. In summary, finding responsible States in and of itself would be in many cases insufficient and further classification is needed to identify the procuring launching State. Of course, if one of the

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[139] *Id.* ¶ 3(d).

[140] *Id.* ¶ 3(c).

[141] Professor Cheng wrote in addition to the operation of a space object in outer space, "activities in outer space" would include (i) launch of space objects from Earth to outer space, (ii) intentional return or reentry of space objects from outer space to Earth and (iii) obtaining immediate results of the operation in outer space on the ground (i.e. receiving remote sensing raw data at the ground facility). Bin Cheng, *Article VI of the 1967 Space Treaty Revisited: "International Responsibility," "National Activities," and "The Appropriate State,"* 26 J. SPACE L. 19 (1998).

[142] *See* Hobe et al., *supra* note 136, at 506-09.

[143] See, e.g., Japanese Act on Launching of Spacecraft, etc. and Control of Spacecraft, Act No. 76, Nov. 16, 2016, arts. 4, 20 & 26.

[144] CHENG, *supra* note 3, at 486-88.

responsible States voluntarily registers a satellite, this is acceptable, for becoming a procuring launching State is a national policy.

The same logic is employed for the on-orbit transfer of supervision of a satellite. As we have seen, currently, transfer of registration is not carried out while it seems possible between launching States. Besides, it is not clear if it is legal to transfer the registration from State of registry to non-launching State or between two non-launching States under the UN Space Treaties. Thus, the Registration Practice Recommendations focuses on a strengthened information provision system. It is recommended that if supervision is changed from the State of registry to a non-State of registry, or if neither the transferor nor transferer is the State of registry, a State responsible for its private space activities could furnish to the UN Secretary-General additional information concerning the change the status of space object such as: "(i) The date of change in supervision; (ii) The identification of the new owner or operator; (iii) Any change of orbital position; (iv) Any change of function of the space object."[145] It should be noted that if the information from (i)-(iv) is always furnished, it would match ship-level or aircraft-level registries.

Likewise, the Registration Practice Recommendations encourage more standardized and detailed contents in national registries and information provided to the UN Secretary-General as well as a quasi-public notice system of official information on space objects carried in national registries through web links.[146] A new standardized registration form in accordance with these Recommendations was made by UNOOSA and this increased States carrying out UN registrations using this form.[147] Today, increased web links to national registries of space objects is available.[148] Thus, it may be said that space objects may now have almost the same level of registries as ships and aircraft.

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[145] Registration Practice Recommendations, *supra* note 2, ⁋⁋ 4(a)(i)-(iv), 4(b).

[146] *Id.* at Preamble, ⁋ 2(a)-(c).

[147] The updated model registration form is provided in 2020 as NOOSA/REG/FRM/1(E). *See United Nations Register of Objects Launched into Outer Space – Resources ad reference Material for States & Organizations*, U.N. OFF. OUTER SPACE AFF., https://www.unoosa.org/oosa/en/spaceobjectregister/resources/index.html (last visited Nov. 20, 2020).

[148] *See* UN Register of Objects Launched into Outer Space, *supra* note 130.

While some disparity may exist, five points identified as the implications of the nationality of ships and aircraft described in Part III seem to be shared by a specific State and the space object. Thus, it may follow to say that nationality has been implicitly accorded to space objects. As the residual issue, the characteristics of the genuine link between a specific State and the space object would be clarified below.

C. Nationality Found

The advantage of the UK practice to find a general link has to be noted. While there are plural responsible States for one satellite, the effective control of that satellite is maintained by only one operator. The national State of that operator, if it can be identified, shall be the procuring launching State, and by registering the satellite, that State implicitly confers nationality to the satellite concerned. The procuring launching State is the primary genuine link between the State of registry and a space object. The practice of tacit conferral of nationality to space objects was established around the beginning of 2010s and since then States have been implementing the Registration Practice Recommendations and making more national space activities acts.[149]

The UK practice shows how to choose the procuring launching State among possibly plural responsible States. For example, both the UK and US are qualified as responsible States for GE-SATCOM-1A under Article VI of the Outer Space Treaty. Nevertheless the US is the procuring launching State as agreed between the two States, because a US private person has effective control on GE-SATCOM-1A although the UK licensed its launch.

This can be taken to mean that a State whose non-governmental entity holds effective control over a satellite as an operator is the State that should register and confer nationality on that satellite. There must be cases where none of the plural responsible States could find effective control over a satellite by its national, but the satellite may be placed in the national registry of one of the States in accordance with the Registration Practice Recommendations. [150] This is a policy decision, and in this case, "national

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[149] *See* G.A. Res. 68/74 (Dec.11, 2013).

[150] Registration Practice Recommendations, *supra* note 2, ¶ 3(c).

activities in outer space" is recognized as a genuine link (secondary genuine link).

As found in the UK practice, there are cases where no responsible States registers a satellite, but only furnishes information to the UN Secretary-General. Those satellites are stateless satellites. Fortunately, reasonably sufficient information is given to the UN Secretary-General and some States, like the UK, hold a secondary registry other than the formal national registry. Hence, identification of stateless satellites is not so difficult today.

VI. CONCLUDING REMARKS

Nationality is not explicitly conferred on space objects under the UN Space Treaties. However, the development of State practice and UNGA Resolutions, especially the Registration Practice Recommendations, have developed conditions that space objects are implicitly conferred nationality as below. All five conditions identified from the nationality criteria of ships and aircraft seem to be now satisfied by space objects.

(i) Nationality is implicitly conferred via registration on a space object by the State which has genuine link. The primary genuine link is the, "procuring launching State."

(ii) However, identifying the procuring launching State is not necessarily easy. The secondary genuine link is the responsible State under Article VI of the Outer Space Treaty. This is a weaker link than a procuring launching State, but if a State registers a satellite based on this link, this becomes the primary genuine link.

(iii) The national State of the operator who has effective control over a space object is under the obligation to exercise effective jurisdiction and control. This is accomplished by observing the safety operation requirements under the UN Space Treaties. Such State is also expected to implement non-legally binding UNGA Resolutions and other relevant instruments.

(iv) The methods of identification of nationality (registration) are duly enriched by the Registration Practice Recommendations and national space acts reflecting them.

(v) IGOs may exercise jurisdiction and control over their registered satellites. This is not a typical nationality case, but as precedents of ships and aircraft show, this practice is accepted under the treaty rules reflecting the development of international law.

Without registration, space objects would be Stateless. Nationality is a means of maintaining safety and security of space activities by identifying the State responsible for, and entitled to, oversight, control and protection of the activities of space objects. In order to enhance the aspect of protection, awareness raising for registration is recommended. The opportunity to protect space objects will be incredibly valuable in the age of on-orbit servicing, active debris removal, space resources mining and private human spaceships. Professor Bin Cheng rightly claimed the necessity of nationality of spacecraft, and through State practice and development of international space law, since around the beginning of the 2010s, it seems that nationality has been implicitly conferred to space objects. The existence of nationality may still be latent at this moment, but its whole picture will be clear with increased private human space activities for which the exercise of quasi-territorial jurisdiction is indispensable.

RULES OF THE "SPACE ROAD:" HOW SOFT LAW PRINCIPLES INTERACT WITH CUSTOMARY INTERNATIONAL LAW FOR THE REGULATION OF SPACE ACTIVITIES

Steven Freeland and Yun Zhao[*]

ABSTRACT

Professor Bin Cheng is credited with the notion that space law, unlike other legal regimes such as air law, can include elements that arise as "instant" customary international law. For Professor Cheng, such customary international law represents an important component of the regulation of outer space exploration and use alongside the United Nations (UN) space treaties, the last of which was concluded more than four decades ago. Although it is true that the UN space treaties codify important principles of customary international law, it is highly likely that additional customary international law principles have continued to develop in the past forty years. The fact that States have continued to engage in "new" space activities and have demonstrated relatively consistent behavioral practices in specific respects points to a continually evolving body of law. In addition, and perhaps more significantly, the increasing use of so-called "soft law" instruments as markers and standard setters for various existing and emerging space activities is indicative of an overall consensus on how to engage responsibly and sustainably in space. This article examines the development of these soft law instruments and discusses whether, and if so how, some of the more significant guidelines they encapsulate can be regarded as customary international law.

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I. INTRODUCTION

The world's perception of what is possible in outer space was forever altered on October 4, 1957. The Soviet Union's successful launch on that date of a tiny space object known as *Sputnik 1*[1] made it clear that humankind would henceforth strive to develop the technological capability to engage in what was to become an overwhelmingly broad range of space activities. Initially seen by the two major space powers of the time, the Soviet Union and the United States, as an arena that demanded an extension of their respective military and strategic capabilities, our use of outer space has diversified significantly since those heady early days. Although outer space remains an important geopolitical arena with significant national security implications, it is also a highly commercial, civil, scientific, cultural and even religious domain that is intertwined with the very essence of humanity and its future survival.

It is little wonder, therefore, that even as early 1957 it was clear an agreed understanding of the legal parameters of, and a legal framework for, humanity's relationship to and activities in outer space was necessary. Professor Bin Cheng was at the forefront of academic thought and scholarship on these lofty issues from the outset.[2] He is credited with the notion that, unlike other legal regimes such as air law, space law can include elements that arise as "instant" customary international law.[3] For Professor Cheng, such customary international law represents an important component of the regulation of outer space exploration and use alongside the UN Space Treaties.[4]

This article examines the development of soft law instruments in the outer space arena and discusses whether, and, if so, how, some of the more significant guidelines they encapsulate can also

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[1] Sputnik 1, which launched on October 4, 1957, is widely celebrated as the dawn of the space age and most certainly the "kick-off" of the space race between the United States and the Soviet Union. *See* Mike Wall, *Sputnik 1! 7 Fun Facts About Humanity's First Satellite,* SPACE.COM (Oct. 4, 2020), https://www.space.com/38331-sputnik-satellite-fun-facts.html

[2] *See, e.g.*, Bin Cheng, *International Law and High Altitude Flights: Balloons, Rockets and Man-Made Satellites*, 6 INT'L & COMP. L.Q. 487 (1957).

[3] *See* Bin Cheng, *Custom: The Future of General State Practice in a Divided World, in* THE STRUCTURE AND PROCESS OF INTERNATIONAL LAW: ESSAYS IN LEGAL PHILOSOPHY DOCTRINE AND THEORY 513, 532 (R. St. J. MacDonald & Douglas M. Johnston eds., 1983).

[4] As defined *infra* notes 9 -13 and accompanying text.

be regarded as customary international law. Part II of the article examines the existing space treaties as "hard" international law, as well as their application to space activities. Part III then looks into the necessity of soft law for the regulation of space activities, followed by an examination of the most important soft law instruments in the space law field in Part IV. Part V concludes by arguing that the adoption and application of soft law instruments, some of them perhaps reflecting what might be emerging principles of customary international law, are essential to the orderly development of space activities in view of the failure to adopt binding space conventions since 1979.

II. INTERNATIONAL LAW APPLICABLE TO THE REGULATION OF SPACE ACTIVITIES

In the wake of the Soviet Union's successful launch of *Sputnik 1*, the United Nations General Assembly (UNGA) in 1958 set up an *ad hoc* Committee on the Peaceful Uses of Outer Space. The committee was tasked with considering and reporting on various issues relating to the peaceful exploration and use of outer space, including: (i) the activities and resources of the United Nations, the specialized agencies and other international bodies relating to the peaceful uses of outer space; (ii) international cooperation and programs in the exploration and use of outer space that could appropriately be undertaken under United Nations auspices; (iii) organizational arrangements to facilitate international cooperation in the exploration and use of outer space within the framework of the United Nations; and (iv) legal problems that might arise in programs to explore outer space.[5]

The *ad hoc* committee was subsequently converted in 1959 into a permanent body, initially with 24 member States,[6] known as the

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[5] G.A. Res. 1348 (XIII) (Dec. 13, 1958). The eighteen States in this *ad hoc* Committee were Argentina, Australia, Belgium, Brazil, Canada, Czechoslovakia, France, India, Iran, Italy, Japan, Mexico, Poland, Sweden, the Union of Soviet Socialist Republics, the United Arab Republic, the United Kingdom of Great Britain and Northern Ireland and the United States of America. *Id.*

[6] *See* G.A. Res. 1472 (XIV) (Dec. 12, 1959). In addition to the original eighteen States, Albania, Austria, Bulgaria, Hungary, Lebanon and Romania were also included as member States of this permanent body. UNCOPUOS currently has 95 member States and is described as "one of the largest Committees in the United Nations." *COPUOS*

United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS). In 1962, the United Nations Office for Outer Space Affairs (UNOOSA) was established to assist UNCOPUOS in its work.[7] Since that time, UNCOPUOS has been at the forefront of space law development, both in the form of "hard" treaties and less traditional and non-binding "soft" formats.

UNCOPUOS is expected to continue in its role as the principal multilateral forum within which the regulatory and behavioral frameworks for space will be negotiated and finalized, although the increasingly commercial character of many outer space activities means that other international bodies are also seeking to promote the development of regulatory instruments.[8]

The five United Nations space treaties (UN Space Treaties) that have been finalized through the UNCOPUOS process to date are as follows:

> (i) 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies;[9]
>
> (ii) 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space;[10]

History, U.N. OFF. OUTER SPACE AFF., http://www.unoosa.org/oosa/en/COPUOS/cop_overview.html (last visited Aug. 20, 2020).

[7] *History,* UNITED NATIONS OFF. FOR OUTER SPACE AFF., https://www.unoosa.org/oosa/en/aboutus/history/index.html (last visited Feb, 20, 2021).

[8] For example, the Protocol to the [Cape Town] Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets (Space Assets Protocol), which is not yet in force, was finalized in 2012 under the auspices of the International Institute for the Unification of Private Law (UNIDROIT). The Space Assets Protocol would, if and when it comes into force, be the first operative multilateral treaty to be negotiated and drafted outside the UNCOPUOS regime that specifically deals with space assets (although it is to be noted that, even then, it does not address any activity, rights or obligations over or in space or arising therefrom).

[9] 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].

[10] 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 Rescue and Return Agreement].

(iii) 1972 Convention on International Liability for Damage Caused by Space Objects;[11]

(iv) 1975 Convention on Registration of Objects Launched into Outer Space;[12] and

(v) 1979 Agreement Governing the Activities of States on the Moon and other Celestial Bodies.[13]

All five treaties deal with important issues relating to outer space. In addition to the fundamental non-appropriation, freedom and peaceful purposes principles, they also establish the (partial) demilitarization of outer space, [14] as well as a liability regime applicable in the case of damage caused by space objects.[15] They also address a number of other areas, including the safety and rescue of space objects and astronauts,[16] the prevention of harmful interference with space activities and with the environment,[17] the notification and registration of space activities with the United Nations,[18] the scientific investigation and exploitation of the natural resources of outer space and the settlement of disputes arising from outer space activities.[19]

In addition to these treaties, it has also long been accepted that customary international law represents one of the "sources" of space law.[20] Moreover, it is widely recognized that many of the principles contained within the treaties, in particular the Outer Space

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[11] 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].

[12] 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].

[13] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement].

[14] *See, e.g.,* Outer Space Treaty, *supra* note 9, arts. I, II & IV.

[15] *See, e.g., id.* at art. VII; Liability Convention, *supra* note 11.

[16] *See, e.g.,* Rescue and Return Agreement, *supra* note 10.

[17] *See, e.g.,* Outer Space Treaty, *supra* note 9, art. IX.

[18] *See, e.g., id.* at art. VIII; Registration Convention, *supra* note 12.

[19] *See, e.g.,* Moon Agreement, *supra* note 13, arts. 11, 15.

[20] *See generally*, BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW (1997); Vladlen S Vereshchetin &Gennady M Danilenko, *Custom as a Source of International Law of Outer Space*, 13 J. SPACE L. 22 (19855); Steven Freeland & Ram Jakhu, *The Relationship Between the Outer Space Treaty and Customary International Law*, in PROC. OF THE INT'L INST. OF SPACE L. 183 (2017).

Treaty, also reflect customary international law and are thus binding on parties and non-parties alike.[21]

In fact, as Professor Cheng himself recognized as early as 1965, the unique environment of space, as well as the rapid development of new space activities, raised the distinct possibility that, in contrast to other then-traditional conceptions regarding the gradual emergence of customary international law, developments in space might in certain circumstances give rise to what he referred to as "instant customary law." He argued, for example, that the United Nations' Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space,[22] (Declaration of Legal Principles) which preceded the Outer Space Treaty, could have instantaneously formed customary international law.[23] It is even possible that certain provisions of that declaration were declaratory - rather than representing a point of crystallization - of already existing customary international law. One example is paragraph 3 of the Declaration of Legal Principles - the terms of which were subsequently incorporated (with only minor amendment) into Article II of the Outer Space Treaty.[24] It specifies

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[21] *See generally,* Freeland & Jakhu, *supra* note 20.

[22] G.A. Res. 1962 (XVIII), Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (Dec. 13, 1963) [hereinafter Declaration of Legal Principles]. The Declaration of Legal Principles was the first codification of some of the fundamental principles that were ultimately to govern the exploration and use of outer space. It set out a series of nine general principles that were, with only relatively minor amendment, included in the Outer Space Treaty some four years later. *See* Outer Space Treaty, *supra* note 9.

[23] Bin Cheng, *United Nations Resolutions on Outer Space: 'Instant' International Customary Law?*, 5 INDIAN J. INT'L L. 23 (1965). More recently, Cheng noted: "There is no reason why a new *opinio juris* may not grow overnight between States so that a new rule of international customary law (or unwritten international law) comes into existence instantly. This shows that international law is a living law, and explains how changes take place." CHENG, *supra* note 20, at 147.

[24] For detailed analysis of Article II of the Outer Space Treaty, see Steven Freeland &Ram Jakhu, *Article II, in* COLOGNE COMMENTARY ON SPACE LAW VOL. I 44 (Stephan Hobe et al. eds., 2009). Irrespective of whether one agrees with the declaratory or crystallizing character of paragraph 3 of the Declaration of Legal Principles, it is broadly agreed that the non-appropriation principle represented customary international law *before* its inclusion in the Outer Space Treaty. Indeed, by the time that treaty was finalized, both the United States and Soviet Union were already engaged in an extensive range of space activities, and yet neither had made a claim to sovereignty over any part of outer space, including celestial bodies. Of course, in 1967, it was unclear which of the two States would "win" the race to land a human on the surface of the Moon. In that context of uncertainty, both recognized that any such claims would not be acceptable to

that "[o]uter space and celestial bodies shall not be subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[25]

Another distinguished commentator, C. W. Jenks, went even further with regard to the status of the Declaration of Legal Principles. Prior to the conclusion of the Outer Space Treaty, he asserted that the Declaration's authority "may be expected to grow with the passage of years," adding that "[w]hile it is somewhat less than a treaty it must already be regarded as *rather more than a statement of custom*."[26]

In a similar vein to Professor Cheng's suggestions regarding the possibility of instant customary law in relation to the rules applicable to outer space, Judge Manfred Lachs of the International Court of Justice, in describing the early emergence of the customary international principle of freedom to engage in space activities, observed that:

> [t]he first instruments that men sent into outer space traversed the air space of States and circled above them in outer space, yet the launching States sought no permission, nor did the other States protest. This is how the freedom of movement into outer space, and in it, came to be established and recognised as law within a remarkably short period of time.[27]

This brief discussion of both applicable treaty and customary international law confirms the long-standing existence of a significant body of hard international law, emanating from traditional, widely accepted sources of public international law[28] that regulates

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the other, as well as the wider international community, and would in any event significantly ratchet up the potential for conflict in outer space arising from attempts at colonization. This viewpoint was not challenged in any way by the planting by the Apollo 11 astronauts of an American flag on the surface of the Moon in 1969.

[25] Declaration of Legal Principles, ¶ 3. This principle had earlier been referred to in paragraph 1(b) of United Nations General Assembly Resolution 1721(A) (XVI) on International Co-operation in the Peaceful Uses of Outer Space (1961), which provided that "[o]uter space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation."

[26] C.W. JENKS, SPACE LAW 185 (1965).

[27] North Sea Continental Shelf Cases (Ger. v. Den. and Ger. v. Neth.), Judgment, 1969 I.C.J. Rep. 3, 230 (Lachs, J., dissenting).

[28] For broad analysis of the "sources" of international space law, see Ram Jakhu, Steven Freeland & Kuan-Wei Chen, *The Sources of International Space Law: Revisited,* 67 GER. J. AIR & SPACE L. 606 (2018).

States (and certain international intergovernmental organizations) in their pursuit of the exploration and use of outer space. Such a body of law was a natural consequence of the need to establish fundamental principles underpinning the legal regulation of outer space activities in a form that would unquestionably be binding upon, and accepted as such, by space-faring nations.

Yet, as is well known, the most recent of the UN Space Treaties, the Moon Agreement, was finalized in 1979. Further, in the more than forty years since its formal adoption, that agreement has received only eighteen ratifications and four signatures,[29] very low numbers when compared with those for the four other UN Space Treaties.[30] Of even greater significance is that none of the major space-faring States has ratified the Moon Agreement. Although there are many reasons for the lower degree of ratification,[31] what it has meant from a *realpolitik* perspective is that it has not been possible since 1979 to negotiate and agree further binding hard space law instruments through the consensus decision-making processes of UNCOPUOS, and this is likely to remain the case for the foreseeable future.

At the same time, the continual—and rapid—development of space-related technology since 1979 means that an ever-greater array of activities are possible in outer space, and are indeed being undertaken not only by States, but increasingly by private sector entities as well. The development and future prosperity of virtually every country is now much more reliant upon space technology. Accompanying the demand for such technology is the development of massive commercial space "industries," which has given rise in turn to the development of additional technology.

A prominent trend today is the miniaturization of space technology, which has furthered the potential for making use of outer

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[29] *See Status of International Agreements Relating to Activities in Outer Space as at 1 January 2020*, U.N. OFF. OUTER SPACE AFF., https://www.unoosa.org/documents/pdf/spacelaw/treatystatus/TreatiesStatus-2020E.pdf (last visited Sept. 24, 2020).

[30] *See id.* By way of comparison, at the beginning of 2020, the Outer Space Treaty had 110 ratifications, the Rescue Agreement 98, the Liability Convention 98 and the Registration Convention 69. *Id.*

[31] *See* Stephan Hobe et al., *The Moon Agreement*, *in* COLOGNE COMMENTARY ON SPACE LAW, VOL. II 325 (Stephan Hobe et al. eds., 2009).

space.[32] These developments have also seen an increasing number of States developing and promulgating national space law to comply with their international treaty obligations[33] and to regulate the space activities of non-governmental entities within their jurisdictions.[34]

Although the fundamental principles of the UN Space Treaties, as well as "international law, including the Charter of the United Nations,"[35] remain highly relevant and applicable to the exploration and use of outer space, they do not provide the level of specificity or direction needed to give clarity to every aspect of the conduct of many space activities. This lack of clarity does not necessarily represent an impediment to the implementation of activities in outer space. After all, States and non-governmental entities alike have continued to utilize space technology in ways that are not comprehensively addressed in existing hard law principles. Rather, the problem is that the law lags behind such technology to quite a significant degree, leaving a number of grey areas relating to the exploration and use of outer space.

In practice, even at a relatively early stage of the space era, the rights and obligations under the five UN Space Treaties were insufficiently comprehensive to adequately clarify the principles and procedures that should be applied to such emerging (commercial) activities as direct television broadcasting via satellite and the remote sensing of Earth from outer space, not to mention space technology involving the use of nuclear power sources. Accordingly, over time a tendency has emerged for the international community to increasingly resort to and rely upon what are typically referred to as soft law instruments - initially in the form of UNGA resolutions but subsequently through various guidelines and codes of conduct - to set out additional principles relating to the exploration and use of outer space.

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[32] *See* Steven Freeland, *Legal Issues Related to the Future Advent of Small Satellite Constellations*, *in* HANDBOOK OF SMALL SATELLITES 1315 (Joseph N. Pelton ed., 2020).

[33] *See* Outer Space Treaty, *supra* note 9, art. VI.

[34] *See* Steven Freeland, *The Development of National Space Law*, *in* CONTEMPORARY ISSUES FOR NATIONAL AND INTERNATIONAL SPACE LAW: COMMENTARY AND SOURCE MATERIALS 12 (Steven Freeland et al. eds., 2012).

[35] *See* Outer Space Treaty, *supra* note 9, art. III.

III. THE NEED FOR SOFT LAW IN THE INTERNATIONAL LEGAL REGULATION OF SPACE ACTIVITIES

For the purposes of this article, soft law instruments are defined as written multilateral instruments that are in the public domain. Further, although they may purport to specify rules of conduct or standards of achievement, they do not emanate from the traditional sources of public international law and are not intended to be binding. It should also be recognized that the concept of soft law is not one that Professor Cheng himself necessarily regarded as appropriate for application to the legal regulation of *sui generis* regimes such as outer space; indeed, he argued that such "pseudo law . . . can be the worst enemy of the Rule of Law."[36]

Indeed, it might be a little perplexing to some that we are referring to these instruments as soft *law* instruments, given that they are clearly not intended to be of a legally binding nature, and thus are not law in the generally understood sense. In fact, in line with Professor Cheng's thinking, one might argue that something either *is* or *is not* law. To clarify, soft law instruments are to be differentiated from treaties, which are intended to be binding and which have the characteristics indicated in the definition of a treaty for the purposes of the Vienna Convention on the Law of Treaties: "an international agreement concluded . . . in written form and governed by international law."[37]

It must also be noted that this general interpretation of what constitutes soft law is by no means unanimously supported. It is beyond the scope of this article, however, to discuss the various alternate theories of soft law. Suffice to say that some commentators include within the rubric of soft law those (legally binding) treaties that contain what might be described as soft *obligations*, a notion that is sometimes referred to as "legal soft law."[38] It could be noted

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[36] Cheng, *supra* note 23, at 48.

[37] Vienna Convention on the Law of Treaties art. 2(1)(a), May 23, 1969, 1155 U.N.T.S. 331 [hereinafter Vienna Convention]. Note also that what constitutes a treaty for the purposes of *national* law may be different. For example, the 1998 Agreement Concerning Cooperation on the Civil International Space Station is regarded, for the purposes of U.S. domestic constitutional law, not as a treaty but as an Executive Agreement. In this way, the instrument did not have to be submitted to the U.S. Senate for approval.

[38] *See* C.M. Chinkin, *The Challenge of Soft Law: Development and Change in International Law*, 38 INT'L & COMP. L.Q. 850, 851 (1989).

in passing that certain provisions in the UN Space Treaties have characteristics that arguably approach the notion of legal soft law.[39]

Turning to the soft law instruments that have been developed for the regulation of space activities, if one were to think about public international law (in admittedly overly simplistic terms) as law created "by States for States," then it is clear from both the form and text of those instruments that the States that introduced them did not want to be bound by them *per se*. Indeed, it is more likely that, at least on certain occasions, the instruments were introduced precisely *because* it was accepted that they were not intended to be legally binding. These soft law instruments can therefore be viewed in general terms as providing guidelines or standards of conduct that, although often serving to influence the actions of States in relation to their activities in space, do not in and of themselves have the legal force of binding treaties. Particularly in relation to their use to regulate the exploration and use of outer space, soft law instruments may serve to "overcome a deadlock in relations between States pursuing ideological or economic aims."[40]

When UNCOPUOS began its deliberations on the legal principles that should apply to space activities, it was evident that a comprehensive legal code governing such activities would not be appropriate, or even possible, at that (very early) stage.[41] For one thing, the two space-faring States of the day, namely, the United States and Soviet Union, were not prepared at the time to engage in such negotiations. In addition, the technology concerned, and the opportunities for the advancement of space activities to which this technology would give rise, were not yet widely understood. Accordingly, it was deemed more appropriate to forgo insisting on binding rules immediately (even assuming that such rules would have been politically feasible).

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[39] For example, in the case of a mandatory ("shall") obligation to provide certain information "to the greatest extent feasible and as soon as practicable." *See, e.g.*, Registration Convention, *supra* note 12, art. IV(3). Yet, this remains a binding treaty obligation (even if expressed in such conditional language) that must be complied with by State parties in good faith, in accordance with the fundamental international law principle relating to treaties of *pacta sunt servanda*.

[40] DAVID HARRIS, CASES AND MATERIALS ON INTERNATIONAL LAW 57 (7th ed. 2010) (internal citations omitted).

[41] Vladimir Kopal, *The Role of United Nations Declarations of Principles in the Progressive Development of Space Law*, 16 J. SPACE L. 5, 6 (1988).

Instead, the UNCOPUOS Legal Subcommittee opted to undertake a progressive, gradual approach to the development of space law to remain in step with the advancement of space technology and space applications.[42] With respect to specific satellite applications, for example, it was considered appropriate to adopt an instrument containing principles in the form of a UNGA resolution before completing the negotiations on binding multilateral treaties.[43] This approach gave rise to a number of such resolutions in the period leading up to the eventual finalization of the Outer Space Treaty. Subsequent to the conclusion of the Moon Agreement, however, it has, for the reasons referenced above, not been feasible to formulate further binding multilateral space treaties through the UNCOPUOS process.

These sets of principles provide *inter alia* for the application of international law and the promotion of international cooperation and understanding in relation to space activities; the dissemination and exchange of information through transnational direct television broadcasting via satellite and remote satellite observations of earth; and general standards regulating the safe use of nuclear power sources necessary for the exploration and use of outer space. They are described in more detail in the next section of this article.

More recently, a slightly different phase of soft law development for space activities has emerged. We have now seen a series of non-binding guidelines adopted through the UNCOPUOS process that address such important issues as space debris,[44] and the long-term sustainability of space activities,[45] among others. This is an additional indication of the on-going tendency toward the use of such soft instruments through the UNCOPUOS process, furthering

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[42] *Rep. of the Ad Hoc Comm. on the Peaceful Uses of Outer Space to the Gen. Assembly*, U.N. Doc. A/4141, Part III (1959).

[43] *See* MANFRED LACHS, THE LAW OF OUTER SPACE: AN EXPERIENCE IN CONTEMPORARY LAW MAKING 27-41 (1972).

[44] *See* U.N. OFF. OUTER SPACE AFF., 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.

[45] *See generally* Comm. on the Peaceful Uses of Outer Space, Sci. & Technical Subcomm., *Guidelines for the Long-term Sustainability of Outer Space Activities*, U.N. Doc, A/AC.105/C.1/L.366 (July 17, 2018). These guidelines were adopted by UNCOPUOS in its report on its sixty-second session and set out in full in Annex II thereto. *See* Rep. of the Comm. on the Peaceful Uses of Outer Space on Its Sixty-Second Session, U.N.Doc. A/74/20, ¶ 163 (2019) [hereinafter Long-term Sustainability Guidelines].

the long-established understanding that soft law is a well-accepted approach—and, perhaps, a more practical and achievable approach than hard law—for advancing humankind's endeavors in outer space.

Perhaps the last word regarding the status of the soft law instruments that regulate the behavioral aspects of the exploration and use of outer space should be given to Sir Robert Jennings, who, when discussing UNGA resolutions in general in 1980, wrote that "recommendations may not make law, but you would hesitate to advise a government that it may, therefore, ignore them, even in a legal argument."[46]

IV. SOFT LAW IN OUTER SPACE: A DESCRIPTION OF THE MAIN INSTRUMENTS

Having discussed the general transformation of regulatory development for space activities from traditional hard law toward soft law instruments in the foregoing section, the article now proceeds to outline the salient features of those instruments and the important standards and guidelines they seek to articulate.

A. United Nations General Assembly Resolutions

UNGA resolutions are a major type of soft law documents.[47] Although principles and related resolutions adopted by UNGA also constitute such documents, for the purposes of our discussion of customary international law, only UNGA resolutions will be covered here.

The legal status of five UNGA resolutions in particular deserve serious consideration: the 1963 Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (Declaration of Legal Principles),[48] the 1982 Principles Governing the Use of States of Artificial Earth Satellites for

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[46] HARRIS, *supra* note 40, at 57 (quoting Robert Y. Jennings, *What is International Law and How Do We Tell It When We See It?*, THE CAMBRIDGE-TILBURG LAW LECTURES (3d ser. 1980).

[47] *See* U.N. OFF. OUTER SPACE AFF., INTERNATIONAL SPACE LAW: UNITED NATIONS INSTRUMENTS (May 2017), https://www.unoosa.org/res/oosadoc/data/documents/2017/stspace/stspace61rev_2_0_html/V1605998-ENGLISH.pdf.

[48] Declaration of Legal Principles, *supra* note 22.

International Direct Television Broadcasting (Broadcasting Principles),[49] the 1986 Principles Relating to Remote Sensing of the Earth from Outer Space (Remote Sensing Principles),[50] the 1992 Principles Relevant to the Use of Nuclear Power Sources in Outer Space (Nuclear Power Sources Principles),[51] and the 1996 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 (Cooperation Declaration).[52]

It should be noted that several other resolutions have been adopted since the start of the 21st century, including resolutions concerning the concept of the "launching State"[53] and the practice of registering space objects.[54] The former deals with an important concept in the Liability and Registration Conventions and its application in the era of space commercialization, and the latter consolidates relevant rules in the Registration Convention, facilitating State Parties' ability to strictly comply with registration requirements. Both of these resolutions arise from concepts introduced by the existing space treaties and thus are not discussed in this article.

Of the five aforementioned resolutions, the Declaration of Legal Principles predates the Outer Space Treaty and served as the basis for that treaty, whereas the other four provide further elaboration on and development of the relevant rules in specific fields of space activity. These four resolutions have far-reaching impact in the space arena and, to a large extent, represent the international community's legal consensus on specific space issues as well as providing important guidelines on the development of new space activities. Consequently, their adoption, albeit non-binding in nature, helps to fill the gaps in the regulatory regime for specific space activities, thereby providing a solid basis for future treaty making with respect to those activities.

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[49] G.A. Res. 37/92 (Dec. 10, 1982).
[50] G.A. Res. 41/65 (Dec. 3, 1986).
[51] G.A. Res. 47/68 (Dec. 14, 1992).
[52] G.A. Res. 51/122 (Dec. 13, 1996).
[53] G.A. Res. 59/115 (Dec. 10, 2004).
[54] G.A. Res. 62/101 (Dec. 17, 2007).

i. The Declaration of Legal Principles

The Declaration of Legal Principles is the most important UNGA resolution adopted in the early years of the space era. All of the main space law principles therein were later reproduced in the Outer Space Treaty of 1967 with only minimal change. With more than 100 countries being parties to the Outer Space Treaty, these principles already have a *de facto* binding effect on international society as a whole. Some scholars have argued, however, that some of the Declaration's space law principles constituted customary international law even before the Outer Space Treaty's adoption, with the non-appropriation principle cited as a typical example.[55] Hence, in this sense, the formation of instant customary international law appears to be realistic in the field of space law, as had been suggested by Bin Cheng. Although customary international law normally requires a certain period of time to stabilize its subjective and objective elements, the Declaration of Legal Principles and its evolution into the Outer Space Treaty show that, when widespread international acceptance of legal norms exists, the time needed to produce customary international law may be reduced to several years instead of multiple decades.

ii. Broadcasting Principles

Many countries launched direct television broadcasting via satellites in the 1960s, leading to the reform of communication technology and development of the modern media industry. The Broadcasting Principles, adopted (unusually) by vote (with thirteen votes against and thirteen abstentions),[56] provide important guidance on satellite broadcasting activities. This resolution consists of ten parts, primarily concerning a mixture of contentious points, together with some non-controversial issues—including the purposes and objectives of the Principles,[57] the applicability of international

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[55] *See, e.g.*, Abigail D. Pershing, *Interpreting the Outer Space Treaty's Non-Appropriation Principle: Customary International Law from 1967 to Today*, 44 YALE J. INT'L. L. 149, 164-66 (2019).

[56] Joel R. Paul, Images from Abroad: Making Direct Broadcasting by Satellites Safe for Sovereignty, 9 HASTINGS INT'L & COMP. L. REV. 329, 360 (1986).

[57] G.A. Res. 37/92, *supra* note 49, arts. 1-3.

law,[58] rights and benefits,[59] international cooperation,[60] the peaceful settlement of disputes,[61] State responsibility,[62] duties and the right to consult,[63] copyright and neighboring rights,[64] notification of the United Nations,[65] and consultations and agreements between States.[66]

The Broadcasting Principles reaffirm the role of the International Telecommunication Union in broadcasting activities by acknowledging the application of international law, including the Charter of the United Nations, Outer Space Treaty and relevant provisions of the International Telecommunication Convention and its Radio Regulations.[67] It should also be noted that the resolution's major principles constitute, in the main, either the restatement of the existing space law principles in the Outer Space Treaty or flexible arrangements concerning the peaceful settlement of disputes and consultation in good faith.

The most controversial issue was the relationship between State sovereignty and the free flow of information. This issue was excluded from the final version of the resolution in preference for general provisions on compatibility with the sovereignty rights of States, as well as "with the right of everyone to seek, receive and impart information and ideas."[68] The Broadcasting Principles are thus the end result of compromise between developing and developed countries.

Of the five resolutions on space law principles, this was the only one to be adopted through a majority vote instead of consensus in the UNGA, primarily because of severe disagreement among member States over the controversial provisions concerning State sovereignty and the flow of information described above. The lack of consensus and non-application in practice as to certain aspects

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[58] *Id.* at art. 4.
[59] *Id.* at art. 5.
[60] *Id.* at art. 6.
[61] *Id.* at art. 7.
[62] *Id.* at art. 8.
[63] G.A. Res. 37/92, *supra* note 49, art. 10.
[64] *Id.* at art. 11.
[65] *Id.* at art. 12.
[66] *Id.* at arts. 13-15.
[67] *Id.* at art. 4.
[68] *Id.* at art. 1.

almost certainly prevent the Broadcasting Principles from becoming part of customary international law, even more so in the absence of any clearly stated public change of attitude among the States that voted against it, namely: Belgium, Denmark, the Federal Republic of Germany, Iceland, Israel, Italy, Japan, Luxembourg, the Netherlands, Norway, Spain, the United Kingdom and the United States.[69]

It should be noted that provisions of the Principles concerning less controversial issues (such as rights and benefits, copyright and neighboring rights, which are also major issues related to satellite direct broadcasting) *did* achieve consensus among States. However, these provisions are rather general, and their content is arguably incomplete,[70] possibly because of the failure to reach consensus on the relationship between State sovereignty and the free flow of information. Furthermore, given the rapid technological development in satellite broadcasting, it is doubtful whether the resolution will continue to play a significant role in broadcasting activities. The incompleteness of its content, and its limited practical application, are also relevant in this regard.

iii. Remote Sensing Principles

Similar to satellite broadcasting, remote sensing technologies and activities emerged in the 1960s, with the Remote Sensing Principles adopted in 1986. The resolution was adopted through consensus after 15 years of negotiation.[71] Although it contains provisions restating certain provisions in the Outer Space Treaty, the international community failed to reach consensus on several major issues, including the requirement of prior consent from a sensed State (i.e. a State that a remote sensing satellite would overfly and photograph or otherwise "sense"). Nevertheless, the resolution's general principles have played an important role in remote sensing activities in practice, and no country to date has disputed its application.

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[69] *See Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting*, U.N. DIGITAL LIBR., https://digitallibrary.un.org/record/1493353?ln=en (last visited Aug. 22, 2020).

[70] NANDASIRI JASENTULIYANA, PERSPECTIVES ON INTERNATIONAL LAW 429 (1995).

[71] Gerald J. Mossinghoff & Laura D. Fuqua, *United Nations Principles on Remote Sensing: Report on Developments, 1970-1980,* 8 J. of Space L. 103, 105 (1980)(The Scientific and Technical Subcommittee of the COPUOS established the "Working Group on Remote Sensing of the Earth by Satellites" in 1971).

The Remote Sensing Principles comprise 15 principles covering remote sensing activities. Several principles are simply a restatement (and extension) of principles in the Outer Space Treaty, including: Principle II regarding remote sensing activities for the benefit and in the interest of all countries; Principle III on compliance with international law; and Principle V on the promotion of international cooperation.[72]

Thus, our focus here is on the principles that are specific to remote sensing activities, namely, Principles XI and XII. Principle XI deals with the role of remote sensing data in disaster mitigation and management, a role that has received wide international acceptance.[73] We have also witnessed State practice in this area, exemplified by the successful experience of the Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters (Disaster Charter) in 2000.[74]

The Disaster Charter solidifies Principle XI with the aim of facilitating the disaster relief and management process with space data and information received from space facilities. Since its adoption in 2000, the Disaster Charter has been successfully executed to deal with numerous natural disasters,[75] thereby demonstrating the feasibility and effectiveness of data sharing in times of natural disaster. It could, perhaps, be argued that Principle XI has the potential to develop into customary law—particularly due to the Disaster Charter's further development of the principle. The Remote Sensing Principles and the Disaster Charter, however, differ in their scope and purposes; thus, the development of Principle XI into customary law needs further monitoring.

Principle XII provides guidance on the accessibility of remote sensing data, emphasizing that sensed States should have access to such data on a non-discriminatory basis and at a reasonable cost.[76] This principle is more controversial than Principle XI in view of the

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[72] *See* G.A. Res. 41/65, *supra* note 50, Principles II, III & V.

[73] *See id.* at Principle XI.

[74] *See* CHARTER ON COOPERATION TO ACHIEVE THE COORDINATED USE OF SPACE FACILITIES IN THE EVENT OF NATURAL OR TECHNOLOGICAL DISASTERS (Apr. 25, 2000), https://disasterscharter.org/web/guest/text-of-the-charter#Preamble.

[75] *See* INTERNATIONAL CHARTER "SPACE AND MAJOR DISASTERS": A JOURNEY OF 15 YEARS: 2000-2015 (2015), https://disasterscharter.org/documents/10180/66908/15-Years-of-The-International-Charter.pdf.

[76] *See* G.A. Res. 41/65, *supra* note 50, Principle XII.

sensitivity and dual-use nature of remote sensing data. National security rather than data costs is increasingly the primary concern of sensed States, particularly now in the era of the Internet. Furthermore, sensing States may also impose restrictions on the export of remote sensing data out of national security concerns. As a result, there are many hurdles to Principle XII becoming customary law, and the chances of it doing so in the near future are very low.

iv. Nuclear Power Sources Principles

Adopted in 1992, the 11 Nuclear Power Sources Principles provide guidance on and ensure the safe use of nuclear power sources for space activities.[77] In general, they were meticulously drafted and have rigorous wording. Principles 6-10 are largely a reiteration of existing rules in the Outer Space Treaty and other relevant documents, whereas Principles 1-5 are unique to the use of nuclear power sources and thus deserve serious consideration.

A subsequent development in the space-based use of nuclear power sources is the adoption in 2009 of the Safety Framework for Nuclear Power Source Applications in Outer Space (Safety Framework), which further solidifies the principles in the resolution concerning nuclear power sources.[78] The Safety Framework serves as technical guidance based on that resolution and represents "global consensus on best practices for activities related to ensuring the safety" of nuclear-powered space missions.[79] The framework's release not only reiterated the importance of the safe use of nuclear power sources but, more importantly, also reconfirmed the widespread international acceptance of the Nuclear Power Sources Principles and their vital role in ensuring the safe use of nuclear power sources.

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[77] *See* G.A. Res. 47/68, *supra* note 51.

[78] *See* U.N. COMM. ON THE PEACEFUL USES OF OUTER SPACE & INT'L ATOMIC ENERGY AGENCY, SAFETY FRAMEWORK FOR NUCLEAR POWER SOURCE APPLICATIONS IN OUTER SPACE (2009), https://www.iaea.org/sites/default/files/safetyframework1009.pdf.

[79] L. Summerer, R.E. Wilcox, R. Bechtel & S. Harbison, *The International Safety Framework for Nuclear Power Source Applications in Outer Space—Useful and Substantial Guidance*, 111 ACTA ASTRONAUTICA 89, 100 (2015). *See also* Ulrike M. Bohlmann & Steven Freeland, *The Regulation of Space Activities and the Space Environment*, *in* ROUTLEDGE HANDBOOK OF INTERNATIONAL ENVIRONMENTAL LAW 375-91 (Shawkat Alam et al. eds., 2013).

It should be noted that Principles 1-5 have been consistently applied in practice and generally complied with by the international community. Hence, it could be argued that the objective element of State practice has been satisfied. In 2020, the United States delegation to the UNCOPUOS confirmed its compliance with the spirit of both the Nuclear Power Sources Principles and the Safety Framework,[80] and the Russian Federation's delegation prepared an informal paper confirming that Russia's approach is in line with the principles and the criteria for the safe use of nuclear power sources set forth therein.[81]

The UNCOPUOS Long-term Sustainability Guidelines also reiterate the important role played by the principles, calling upon States and international organizations to "satisfy the intent of the Principles . . .through applicable mechanisms that provide a regulatory, legal and technical framework that sets out responsibilities and assistance mechanisms, prior to using nuclear power sources in outer space . . ."[82]

v. Cooperation Declaration

The principle of international cooperation in outer space was widely recognized in several earlier UNGA resolutions and included in the Outer Space Treaty. As States are major participants in space activities, international cooperation and coordination among States are important to maintaining space sustainability in the long term. International cooperation is carried out in various forms, including cooperation at the global level, as exemplified by the platform at the UN level (i.e. UNCOPUOS), as well as multilateral, regional and bilateral cooperation. The Cooperation Declaration[83] provides further elaboration with regard to the form and substance of international cooperation.

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[80] U.S. Statement Delivered by Head of Delegation Kevin Conole (Feb. 5, 2020), https://vienna.usmission.gov/2020-copuos-stsc-u-s-on-nuclear-power-sources-in-outer-space/.

[81] Comm. on the Peaceful Uses of Outer Space, Sci. and Technical Subcomm., *Draft Report of the Working Group on the Use of Nuclear Power Sources in Outer Space*, ¶ 8(c), U.N. Doc. A/AC.105/C.1/NPS/2020/L/1 (Feb. 10, 2020).

[82] Long-term Sustainability Guidelines, *supra* note 45, Guideline A.2.2(e).

[83] G.A. Res. 51/122, *supra* note 52.

B. UNCOPUOS Guidelines

i. Long-term Sustainability

Space sustainability has become a significant issue, particularly with regard to space security and the long-term development of space activities. However, the concept of space sustainability is quite general and rather confusing, with no clear or specific goals apart from "a vague reference to an ecological ideal,"[84] and scholars have noted that no official definition in the context of space activities has been adopted.[85] It was not until the adoption in June 2019 of the UNCOPUOS Long-term Sustainability Guidelines that the concept of space sustainability was first defined as

> the ability to maintain the conduct of space activities indefinitely into the future in a manner that realizes the objectives of equitable access to the benefits of the exploration and use of outer space for peaceful purposes, in order to meet the needs of the present generation while preserving the outer space environment for future generations.[86]

This definition, which represents the consensus view of the international community at this stage, emphasizes the peaceful uses of outer space and the need for benefit sharing to realize the long-term goal of sustainability.

In defining space sustainability, the Long-term Sustainability Guidelines set out three requirements for space activities: first, space activities must be carried out solely for peaceful purposes; secondly, they need to take into account the needs and interests of the international community as a whole, and particularly those of developing countries; and thirdly, they need to be mindful of the preservation of the space environment for the use of future generations. The Guidelines apply broadly to all types of space activities, with long-term sustainability the core goal that is to be complemented by peaceful uses of space and benefit sharing. They are thus comprehensive in substance, covering all activities that take place

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[84] C.J. Newman & M. Williamson, *Space Sustainability: Reframing the Debate*, 46 SPACE POL'Y 30, 35 (2018).

[85] *See* L.D. Lopez, *Space Sustainability Approaches of Emerging Space Nations: Brazil, Colombia, Mexico*, 37 SPACE POL'Y 24, 25 (2016).

[86] Long-term Sustainability Guidelines, *supra* note 45, ¶ 5.

in outer space, as well as other issues that may potentially have an impact on outer space and the space environment.

The Long-term Sustainability Guidelines were drafted after years of consultation and deliberation under the auspices of the UNCOPUOS platform, and thus represent a high degree of international consensus. The major space-faring nations have declared their acceptance of the concept of long-term space sustainability, as well as its importance to current and future space activities. Furthermore, the international community has taken concrete measures to promote space sustainability since the adoption of the guidelines.

As an example, China emphasizes the importance of space sustainability in its latest White Paper on Space Activities. According to that document, China has taken an active part in the negotiations on the long-term sustainability of outer space activities organized by UNCOPUOS. It also reiterates China's intention to "promote [the] progress of [the] space industry for [hu]mankind as a whole and its long-term sustainable development."[87]

Similarly, the Sustainability Report and Implementation Plan issued by the United States National Aeronautics and Space Administration (NASA) declares, "NASA will continue to integrate sustainability principles into existing policies and procedures to foster awareness, approaches, and actions for a more sustainable world."[88] Since UNCOPUOS adopted its first set of Sustainable Development Goals in 2015, the European Space Agency has developed and maintained a comprehensive database of space applications, technologies and services to achieve those goals.[89] Developing countries have also exhibited support for the guidelines, with Brazil, Colombia and Mexico publicly supporting the establishment of an international mechanism to promote long-term space sustainability.[90]

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[87] *Full Text of White Paper on China's Space Activities in 2016*, THE STATE COUNCIL – CHINA, http://english.www.gov.cn/archive/white_paper/2016/12/28/content_281475527159496.htm (Dec. 28, 2016).

[88] *Sustainability report and Implementation Plan (SRIP)*, NASA, https://www.nasa.gov/emd/srip (last updated July 24, 2019).

[89] *ESA and the Sustainable Development Goals*, ESA, http://www.esa.int/Enabling_Support/Preparing_for_the_Future/Space_for_Earth/ESA_and_the_Sustainable_Development_Goals2 (Oct. 24, 2018).

[90] *See* Lopez, *supra* note 85, at 28.

It could thus be argued that UNCOPUOS's Long-Term Sustainability Guidelines have great potential for ultimate development into customary international law. They are widely accepted internationally. Although there are ambiguities regarding the scope of space sustainability, the Long-term Sustainability Guidelines have to a large extent helped to clarify the concept and the possible issues it encompasses. Going forward, more countries are expected to make such sustainability part of their domestic policy and laws and to further elaborate space sustainability in line with the guidelines. With sufficient State practice, the guidelines may arguably become *de facto* customary international law.

ii. Space Debris Mitigation Guidelines

The issue of space debris has been on the UNCOPUOS agenda for decades. A major breakthrough was achieved with the adoption of the Space Debris Mitigation Guidelines by the Inter-Agency Space Debris Coordination Committee (IADC) in October 2002. The document was subsequently presented to the Scientific and Technical Subcommittee (STS) of UNCOPUOS in February 2003, and served as the basis of further negotiations among UNCOPUOS members.[91] On the basis of a revised IADC document, UNCOPUOS later adopted the Space Debris Mitigation Guidelines, which were endorsed by the UNGA in 2007,[92] marking a milestone in international efforts to mitigate space debris and preserve the space environment.[93]

These Guidelines are special in the sense that they provide highly technical measures that States ought to take to specifically target space debris. They thus differ dramatically from more comprehensive measures such as the Transparency and Confidence-Building Measures and Long-term Sustainability Guidelines. The Space Debris Mitigation Guidelines are applicable to the "mission planning, design, manufacture and operational (launch, mission

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[91] *See* INTER-AGENCY SPACE DEBRIS COORDINATION COMM., IADC SPACE DEBRIS MITIGATION GUIDELINES (revised 2007), https://www.unoosa.org/documents/pdf/spacelaw/sd/IADC_space_debris_mitigation_guidelines.pdf.

[92] G.A. Res. 62/217 (Dec. 22, 2007).

[93] *See* U.N. OFF. OUTER SPACE AFF., 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 [hereinafter Debris Guidelines].

and disposal) phases of spacecraft and launch vehicle orbital stages."[94]

The document further lays out seven guidelines for mitigating space debris: 1) limit the debris released during normal operations; 2) minimize the potential for break-ups during operational phases; 3) limit the probability of accidental collision in orbit; 4) avoid intentional destruction and other harmful activities; 5) minimize the potential for post-mission break-ups resulting from stored energy; 6) limit the long-term presence of spacecraft and launch vehicle orbital stages in the low-Earth orbit region after mission end; and 7) limit the long-term interference of spacecraft and launch vehicle orbital stages with the geosynchronous Earth orbit region after mission end.[95] These seven guidelines are highly technical, focusing on the specific measures that should be adopted to mitigate space debris. It was thus natural for the Scientific & Technical Subcommittee (STSC), rather than the Legal Subcommittee, of UNCOPUOS to serve as the document's sponsoring body.

As its title indicates, the Space Debris Mitigation Guidelines are not legally binding. Member States and relevant international organizations, although expected to undertake the recommended measures to the greatest extent possible, are free to decide how to implement the guidelines through national mechanisms or multilateral platforms.[96] To strengthen their voluntary and flexible nature, the guidelines allow for exceptions that permit States and international organizations not to implement specific guidelines or elements, albeit only when justification has been provided.[97] Such voluntary and flexible arrangements should facilitate the guidelines' wider acceptance by more countries, helping, potentially, to facilitate their eventual evolution into principles of customary international law.

Customary international law requires sufficient repeated State practice in a specific field within a certain period of time. As their sole target is the mitigation of space debris, the Space Debris Mitigation Guidelines can be further solidified through State practice. The technical measures provided in the guidelines, in view of

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[94] *Id.* at 8.
[95] *Id.* at 2-4.
[96] *Id.* at 2.
[97] *Id.*

their technological neutrality, also help to detach the document from political considerations, thereby laying a solid foundation for their acceptance as law in the long run.

State practice to date suggests that the guidelines enjoy a high level of recognition from the international community, with many countries publicly announcing their support. As early as 2014, for example, Canada, the Czech Republic and Germany submitted a document entitled the Compendium of Space Debris Mitigation Standards, which was subsequently adopted by a number of other countries and international organizations.[98] That document has served as a comprehensive reference to the measures and mechanisms that have been developed and implemented increasingly widely across national legal frameworks.[99]

It is relevant to note that at least a dozen countries and international organizations had mechanisms in place to mitigate space debris by 2014. Such mechanisms can serve as models for other countries intending to establish their own national mechanisms. UNCOPUOS noted with satisfaction during its 62nd session in 2019 that "some States ha[ve] taken measures to enforce the implementation of internationally recognized guidelines and standards relating to space debris through relevant provisions in their national legislation."[100]

The Guidelines for the Long-term Sustainability of Outer Space Activities reaffirm the international consensus on the Space Debris Mitigation Guidelines and further call upon States and international intergovernmental organizations to implement space debris mitigation measures through applicable mechanisms when developing, revising, or amending their national regulatory frameworks.[101] Moreover, the sustainability guidelines reiterate the importance of concrete national and international measures, including international cooperation and capacity building, for increasing compliance with the Space Debris Mitigation Guidelines.[102]

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[98] *See* Comm. on the Peaceful Uses of Outer Space, *Compendium of Space Debris Mitigation Standards Adopted by States and International Organizations*, U.N. Doc. A/AC.105/C.2/2014/CRP.15 (Mar. 18, 2014).

[99] *See id.*

[100] Rep. of the Comm. on the Peaceful Uses of Outer Space on Its Sixty-Second Session, U.N.Doc. A/74/20, ¶ 228 (2019).

[101] Long-term Sustainability Guidelines, *supra* note 45, Guideline A.2, 2(b).

[102] *Id.* at Guideline D.2.

It should be further noted that, although the Space Debris Mitigation Guidelines were adopted by the UNCOPUOS STSC, several delegations articulated their support for them during Legal Subcommittee meetings, expressing their view that the legal aspects of the guidelines need to be reviewed to ensure greater juridical strength. Views were also expressed on the need for closer cooperation between the two UNCOPUOS subcommittees to develop legally binding rules on space debris mitigation.[103]

State practice lends strong support to the possibility of the Space Debris Mitigation Guidelines eventually becoming part of customary international law. Space debris is a serious issue that has been discussed for decades under the UNCOPUOS platform. Since the guidelines' adoption, countries are increasingly including the need for space debris mitigation plans to be provided as a requirement in their domestic legislation, particularly with respect to the process of issuing launching permits.

C. (European Union) International Code of Conduct

The European Union (EU) first put forward a draft Code of Conduct in 2008. Following several amendments, the Draft International Code of Conduct for Outer Space Activities (ICOC) was then issued in 2014. The purpose of ICOC is "to enhance the safety, security, and sustainability of all outer space activities pertaining to space objects, as well as the space environment."[104] ICOC is not legally binding and is open to all States on a voluntary basis,[105] evidencing its soft law nature.

Four principles are outlined in ICOC to guide a wide range of space activities: 1) freedom to access, explore and use outer space for peaceful purposes without harmful interference; 2) refraining from the threat or use of force in outer space; 3) international cooperation in space activities; and 4) peaceful exploration and use of outer space for the benefit and in the interest of humankind.[106] The

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[103] Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifty-First Session, U.N. Doc. A/AC.105/1003, ⁋⁋ 148-55 (Apr. 10, 2012).

[104] EUROPEAN UNION - EUROPEAN EXTERNAL ACTION SERVICE, DRAFT INTERNATIONAL CODE OF CONDUCT FOR OUTER SPACE ACTIVITIES art. 1.1. (Mar. 31, 2014), http://www.eeas.europa.eu/archives/docs/non-proliferation-and-disarmament/pdf/space_code_conduct_draft_vers_31-march-2014_en.pdf.

[105] *Id.* at art. 1.4.

[106] *Id.* at art. 2.

document further provides guidance on organizational aspects and cooperation mechanisms, including independent information sharing and regular meeting mechanisms.

ICOC reiterates the importance of compliance with, and the promotion of treaties, conventions, and other commitments relating to outer space.[107] Accordingly, it builds upon existing legal rules and develops new (closely interrelated) rules based upon those rules. In its current form, and given its evolving process, however, ICOC is very unlikely to develop into customary international law for several reasons.

First, it has received very limited support internationally, with few countries outside the EU declaring support for it. The last major meeting to negotiate ICOC was in 2015, and no substantive developments have taken place since then.[108] Secondly, one of the major purposes of ICOC is to deal with the potential arms race in outer space. However, apart from the Principle on the Peaceful Uses of Outer Space, international society has failed to reach binding rules through major platforms, including the Conference on Disarmament. Even if customary rules arise with regard to disarmament, it would be difficult to argue that those rules originated from ICOC *per se*.

V. CONCLUSION

Since the conclusion of the Moon Agreement in 1979, the international community has failed to agree on any further international space treaties within the UN framework. That failure is due in part to the difficulty of reconciling the diverse interests of the new space-faring nations during the negotiating process. Yet space technologies and activities continue to develop rapidly in spite of the gaps in international space legislation. Consequently, there is an urgent need to devise relevant rules to augment the existing foundational principles and, thus, more effectively regulate the legal issues arising from those technologies and activities.

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[107] *See id.* at art. 3.

[108] *See* SECURE WORLD FOUNDATION, SPACE SUSTAINABILITY: A PRACTICAL GUIDE 32 (2018), https://swfound.org/media/206289/swf_space_sustainability-a_practical_guide_2018__1.pdf.

Due to the post-1979 failure of any additional space treaties, the international community has turned to non-binding legal documents, so-called "soft law" instruments, to fill legal uncertainties unaddressed in the existing "hard" law. Given that, as Bin Cheng noted as early as the mid-1960s, custom plays an important—but often underrated—role in the legal framework governing space activities, it is critical to examine and reexamine these "soft law" documents in order to understand and monitor the extent of their legal status vis a vis customary law. As Cheng postulated, it could be the case that even "soft law" instruments, if accepted and adhered to widely enough, may eventually solidify into customary international law.

Finally, the increasing use of soft law instruments as markers and standard-setters for various existing and emerging space activities is in and of itself indicative of growing consensus on how to engage responsibly and sustainably in space. The application of space law treaties, supplemented by soft law instruments and customary international law principles, will continue to be the major feature of the regulatory regime governing outer space in the future, thereby helping to facilitate the smooth and orderly development of space activities.

PROSPECTS FOR THE DEMILITARIZATION OF OUTER SPACE: FROM "SOFT REGULATION" TO "HARD" TREATY MECHANISMS?

Anatoly Kapustin[*]

ABSTRACT

The 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies[1] (Outer Space Treaty), establishes the obligation of its parties to carry out space activities in the interests of maintaining international peace and security and promoting international cooperation and understanding. It does not, however, prohibit military activities in outer space, if it is not contrary to the Charter of the United Nations (UN). The Outer Space Treaty establishes a regime for the partial demilitarization of outer space, prohibiting: any objects with nuclear weapons or any other weapons of mass destruction from being placed in orbit around the Earth; the placement of such weapons on celestial bodies; and the stationing of such weapons in outer space in any other way. At the same time, the Moon and other celestial bodies are fully demilitarized.

Since the adoption of the Outer Space Treaty, there have been many attempts to limit the military use of space by concluding additional international agreements. This was done even during the Cold War era when Great Power competition between the United States and the Union of Soviet Socialist Republics was at its height. In the modern era, efforts are being made to ensure the demilitarization of outer space via the drafting and conclusion of a special international treaty. Unfortunately, these efforts at international

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[1] 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].

treaty-making have, thus far, been unsuccessful. This has led proponents of demilitarization to seek to achieve their goals in other ways: by putting forward new or alternative initiatives, developing and adopting acts of "soft law" and encouraging the passage of resolutions in the United Nations General Assembly, regional international organizations and the like. The expert community offers the doctrinal model parameters for the implementation of military activities in outer space.

In the context of the multi-vector development of regulators restricting military activities in space the question arises about the prospects for strengthening the regime of its demilitarization in the near future.

I. INTRODUCTION

I have enthusiastically accepted the offer of Sa'id Mosteshar, Director of The London Institute of Space Policy and Law, to contribute to this issue of the *Journal of Space Law* dedicated to commemorating Professor Bin Cheng's great contribution to the development and understanding of international space law. My teacher and friend Professor Gennady P. Zhukov,[2] the patriarch of Russian doctrines of international space law, succinctly described to me the seminal nature of Professor Cheng's *Studies in International Space Law* (1997), as one of Cheng's most remarkable works.[3] Zhukov emphasized the importance of this book's comprehensive analysis of the development of space law, from the pre-satellite period to the present day. According to Zhukov, special attention should be paid to Cheng's interpretation of the concept of space exploration for peaceful purposes, which is consistent with the understanding of

[2] Gennady Petrovich Zhukov (1924-2014) is a doctor of law, professor, honored lawyer in Russia. In 1966, he defended the first thesis of the Doctor of Law in the USSR on international legal problems of space exploration. Zhukov was an academician of the International Academy of Astronautics since 1965. For fifteen years, he was Vice President of the International Institute of Space Law, after which he became an Honorary Director. Zhukov participated in international conferences, including sessions of the Legal Subcommittee of the United Nations Committee on Outer Space (1963, 1979) and the UN Committee on Outer Space (1979). He was part of the Working Group on direct broadcast satellites (1970) and the UN Conference on Outer Space (1968). In 1968, he was awarded a gold medal and diploma of the International Astronautical Federation and International Institute of Space Law for "Contribution to the Research Development of International Space Law."

[3] BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW (1997).

this issue by Russian lawyers.[4] Thus, among the many reasons for Russian legal experts and jurists to appreciate Professor Cheng's significance and work is the contribution of this outstanding British legal scholar to the formation and propagation of international space law doctrines that largely mirror Russian (and, formerly, Soviet) interpretations of international space law.

In his works, Professor Cheng considered a wide range of issues related to international space law, including a fairly detailed study of the problem of military uses of outer space. Today, not only are the problems related to the peaceful use of outer space still relevant, but, even more specifically, the issues of determining permissible limits for military activity and efforts to ban outer space from becoming a theater of war are waiting to be resolved.

The Russian doctrine related to international space law has traditionally emphasized the problem of demilitarization of outer space and space activities since the Soviet period of its history. Great contributions to the doctrinal foundations of space demilitarization have been made by Professor Zhukov,[5] Professor Yuri M. Kolosov,[6] and Judge Vladlen S. Vereshchetin.[7] Ongoing research in the field of international space law has further expanded the scope of this study.[8] In particular, there are works that propose the concept of international legal regulation of military space activities, although in the past, especially during the Soviet period, the topic was mainly focused on the prohibition of the militarization of outer space.[9] In this article, I will offer a modern understanding of the problem of demilitarization of outer space and space activities and the prospects for their international legal solution.

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[4] *See* GENNADY P. ZHUKOV & YURI M. KOLOSOV, INTERNATIONAL SPACE LAW 74 (Boris Belitzky trans., 2d ed. 2014).

[5] *See, e.g.*, GENNADY P. ZHUKOV, OUTER SPACE AND THE PEACE (1985).

[6] *See, e.g.*, YURI M. KOLOSOV, BOR'BA ZA MIRNYÏ KOSMOS [STRUGGLE FOR PEACEFUL SPACE: LEGAL ISSUES] (2d ed. 2014).

[7] *See generally* VLADLEN S. VERESHCHETIN, LEGAL ASPECTS OF PROHIBITING THE USE OF FORCE IN OUTER SPACE AND PREVENTING THE SPACE ARMS RACE//SPACE WEAPONS: THE SECURITY DILEMMA 172 (1986).

[8] *See e.g.*, Mikhail Nikolaevich Lysenko, Pravovye Problemy Perspektivy Zapreshcheniiā Oruzhiiā v Kosmose [Legal Problems and Prospects for Banning Weapons in Space] (2006) (dissertation, Moscow State University) (on file with author).

[9] See, e.g., Anatoly I. Antonov, Mezhdunarodno-pravovoe regulirovanie voenno-kosmicheskoĭ deiātel'nosti [International Legal Regulation of Military Space Activities], 4 MGIMO UNIV. BULL. 190, 196 (2012).

II. NUCLEAR DISARMAMENT AND DEMILITARIZATION OF OUTER SPACE

Initially, ideas about the need for international legal regulation of the activities of States in outer space were expressed in the period before the Second World War in the 1920s and 1930s. This was due to the development of aeronautics and its international legal regulation, which led to the birth of international air law. For advanced scholars of that era, it became clear that the next stage of development of the surrounding world would be space.[10] It is logical that the beginning of the space age, opened by the launch of *Sputnik I* on October 4, 1957, marked the beginning of the development of international documents, which were formulated drafts of normative regulation of conduct of States in space. The global nature of space exploration has determined the leading role of the United Nations (UN) in determining the legal strategy for this activity. The main ideas about the legal framework for international space regulation were set out in the form of resolutions of the United Nations General Assembly (UNGA). In the first decade of space exploration (1958-1967) the United Nations devoted itself to preparing principles for regulating space activities.

The beginning of the space age coincided with another equally significant era in the development of post-war international relations: the Cold War. The most characteristic feature of this time was the military-political rivalry between the two superpowers—the United States (US) and the Union of Soviet Socialist Republics (USSR or Soviet Union)—which affected all areas of their mutual relations. Space was no exception. Despite this rivalry, however, it was during the Cold War-era that the nuclear superpowers agreed to adopt international treaties that laid the international legal framework for limiting nuclear weapons and other weapons of mass destruction (WMD). The historical paradox was that the first Treaty norms related to outer space were enshrined in

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[10] Soviet scholars also contributed to pioneering work on space law. For example, in 1926, Valentin A. Zarzar, an expert in the field of international air law, suggested the development of "interplanetary transport law" in the future. *See, e.g.*, STEPHEN E. DOYLE, THE ORIGINS OF SPACE LAW AND THE INTERNATIONAL INSTITUTE OF SPACE LAW OF THE INTERNATIONAL ASTRONAUTICAL FEDERATION 2 (2002) (quoting Valentin A. Zarzar).

disarmament treaties—i.e. in sources of international law that were not directly related to the space sphere.

The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (also known as the Moscow Treaty, or the Partial Test Ban Treaty) was adopted on August 5, 1963.[11] According to Article I(a) of the Moscow Treaty, each of its parties undertakes to prohibit, prevent and not produce any test explosions of nuclear weapons or any other nuclear explosions in any place under its jurisdiction or control in the atmosphere or beyond its borders, including outer space.[12]

Thus, even before the establishment of a special international legal regulation of space activities, mandatory Treaty norms were created within general international law prohibiting the testing of nuclear weapons in space.[13] This marked the beginning of the establishment of the regime of partial demilitarization of outer space and determined the vector of its further demilitarization.

The Soviet Union considered the nuclear demilitarization regime established in the Moscow Treaty to be insufficient, so in the same year, it proposed that the United States agree on a ban on placing objects with WMD on board in space.[14] This proposal was supported by the United States, and as a result, on October 17, 1963, the UNGA adopted Resolution 1884, "Question of General and Complete Disarmament."[15] This document welcomed the intention of the USSR and the United States to refrain from placing

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[11] Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water, Aug. 5, 1963, 14 U.S.T. 1313, 480 U.N.T.S. 43. On September 10, 1996, during the 50th session of the UNGA, the Comprehensive Nuclear Test Ban Treaty was adopted by the United Nations. G.A. Res. 50/245 (Sept. 10, 1996). This Treaty extends the limited nuclear test ban regime to an unconditional framework. Taken together with the Moscow Treaty of 1963, these work to exclude nuclear explosions in Space.

[12] *Id.* at art. I(a).

[13] *See* G.A. Res. 1721 (XVI) (Dec. 20, 1961); G.A. Res. 1962 (XVIII) (Dec. 13, 1963). Indeed, all UNGA resolutions prior to the Outer Space Treaty that were devoted to space exploration, up to Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space Resolution of 1962, did not address issues of the militarization of outer space. *See* G.A. Res. 1962 (XVIII) (Dec. 13, 1963). In addition, it is no accident that the task of the standing committee on the Peaceful Uses of Outer Space, which was formed on the basis of UNGA Resolution 1721 (XVI), was to consider issues of international cooperation in the peaceful uses of outer space. *See* G.A. Res. 1721 (XVI) (Dec. 20, 1961).

[14] *See* ZHUKOV, *supra* note 5, at 30.

[15] G.A. Res. 1884 (XVIII) (Oct. 17, 1963).

objects with nuclear weapons or other types of WMD in orbit around the Earth.[16] Other States were called upon to refrain from placing any objects containing nuclear weapons or any other type of WMD in orbit around the Earth, installing such weapons on celestial bodies, or otherwise placing such weapons in outer space.[17] This resolution formulated a soft law rule limiting the proliferation of nuclear weapons and expanding the demilitarization of outer space.[18] At this stage of the development of the international legal regime of outer space, which was implemented in UNGA resolutions, the issues of the prohibition of nuclear weapons in outer space were not considered at all.

III. THE FORMATION OF INTERNATIONAL SPACE LAW AND THE DEMILITARIZATION OF OUTER SPACE.

The contours of international space law began to be defined immediately after the launch of *Sputnik I.*[19] In response to the initial Soviet success in space travel, the United States launched the *Explorer 1* artificial satellite on January 31, 1958.[20] First, within the framework of the UNGA, and then the UN Committee on the Peaceful Uses of Outer Space (COPUOS), the development of principles for space activities of States began. In particular, the USSR initiated the preparation of special international legal norms regulating the space activities of States, the implementation of broad and equal cooperation in the peaceful exploration of space, and the creation of the necessary bodies for these purposes.[21] Passed in December 1963, Resolution 1962 entitled "Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space," which was considered as the basis for the future Outer Space Treaty, practically did not address the issues of

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[16] *Id.* ¶ 1.

[17] *Id.* ¶ 2.

[18] *Id.* "Soft law" is catchall of non-binding, yet persuasive, sources of international law including United Nations General Assembly resolutions. *See Hard Law / Soft Law*, EUROPEAN CTR. CONST. & HUM. RTS., https://www.ecchr.eu/en/glossary/hard-law-soft-law/ (last visited Oct. 13, 2020).

[19] *See* Vladimír Kopal, *Evolution of the Doctrine of Space Law*, *in* SPACE LAW: DEVELOPMENT AND SCOPE 17, 19 (Nandasiri Jasentuliyana ed., 1992).

[20] *Explorer 1 Overview,* NASA, https://www.nasa.gov/mission_pages/explorer/explorer-overview.html (last visited Oct. 13, 2020).

[21] *See* G.A. Res. 1472 (XIV) (Dec. 12, 1959).

military use of outer space.[22] The only thing that was included in its preamble was the condemnation of propaganda aimed at or capable of creating or increasing a threat to the peace, violation of the peace or acts of aggression.[23] This rule was contained in Resolution 110 of November 3, 1947, and its mention in the preamble of the Declaration meant extending the condemnation of pro-militarist propaganda to outer space.[24]

It can be said that the lack of provisions on the military aspect of space activities was not an accidental gap, but rather the result of disagreements between the two space powers over the strategy for the military use of space. Therefore, the UNGA limited itself to fixing the principle establishing the extension of the norms of international law to outer space, including the UN Charter, which established the political and legal framework for ensuring sovereignty and mechanisms for collective measures to counter aggression.[25]

The first treaty to address the international legal implications of outer space was the 1967 Outer Space Treaty.[26] This document has several features in terms of establishing legal means to prevent the militarization of outer space. First of all, it establishes the obligation of its participants to carry out activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the UN Charter, in the interests of maintaining international peace and security and promoting international cooperation and understanding.[27] Thus, space activities should be based on international law and the UN Charter and contribute to the achievement of the UN goals in maintaining international peace and security and promoting international cooperation.[28] It should be recognized that the Outer Space Treaty obligations are formulated in very general terms, but

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[22] *See* G.A. Res. 1962 (XVIII) (Dec. 13, 1963).

[23] *Id.* at Preamble.

[24] G.A. Res. 110 (II) (Nov. 3, 1947).

[25] U.N. Charter art. 2, ¶ 4 (requiring that all members refrain from the threat or use of force in their international relations against the territorial integrity or political independence of any State); U.N. Charter art. 51 ("[n]othing in the present Charter shall impair the inherent right of individual or collective self-defense").

[26] Outer Space Treaty, *supra* note 1.

[27] *Id.* at art. III.

[28] U.N. Charter art. 1.

nevertheless they regulate the implementation of space activities in accordance with the most important goals of the United Nations.

Article IV of the Outer Space Treaty establishes the partial demilitarization of outer space forbidding: the placement in orbit around the Earth of any objects with nuclear weapons or any other kinds of WMD; the installment of such weapons on celestial bodies; and the stationing of such weapons in outer space in any other manner.[29] This provision gives legal effect to the preamble to the Outer Space Treaty, which refers to the above-mentioned Resolution 1884.[30] At the same time, the preamble refers to the above-mentioned Resolution 110, but the ban on militaristic propaganda itself is not reflected in the articles of the Outer Space Treaty.[31]

Article IV of the Outer Space Treaty also establishes a complete demilitarization regime for the Moon and other celestial bodies.[32] It provides that the Moon and other celestial bodies are to be used by all States parties to this treaty "exclusively for peaceful purposes."[33] Article IV additionally prohibits "the establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers on celestial bodies."[34] However, "the use of military personnel for scientific research or any other peaceful purposes is not prohibited."[35] It is also not prohibited to use "any equipment or facilities necessary for the peaceful exploration of the moon and other celestial bodies."[36]

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[29] Outer Space Treaty, *supra* note 1, art. IV. The inclusion of Article IV in the Outer Space Treaty allowed Kai-Uwe Schrogl and Julia Neumann to conclude that this Treaty is clearly an arms control treaty, which was the result of the authors' awareness of the need to ban nuclear weapons and other types of WMD in outer space. Kai-Uwe Schrogl, Julia Neumann, *Article IV*, *in* COLOGNE COMMENTARY ON SPACE LAW 72 (Hobe et al. eds., 2009). Does this mean that the Outer Space Treaty is hybrid in nature, that is it regulates both disarmament and space law issues simultaneously, or is the inclusion of provisions on the demilitarization of outer space, the Moon and other celestial bodies intended to recognize the special nature and significance of space disarmament? This question remains unanswered.

[30] G.A. Res. 1884 (XVIII) (Oct. 17, 1963) (calling upon States to "refrain from placing in orbit around the [E]arth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, [or] from installing such weapons on celestial bodies . . .").

[31] *See* G.A. Res. 110 (II) (Nov. 3, 1947) (condemning propaganda designed or likely to provoke or encourage any threat to the peace).

[32] Outer Space Treaty, *supra* note 1, art. IV.

[33] *Id.*

[34] *Id.*

[35] *Id.*

[36] *Id.*

Professor Cheng supported the provision on establishing a complete demilitarization regime for the Moon and other celestial bodies in Article IV of the Outer Space Treaty.[37] He argued that the provision in question should be interpreted in the same way as Article 1 of the 1959 Antarctic Treaty,[38] namely, no military activity for military purposes should be conducted on the Moon and other celestial bodies.[39]

The international legal regime for the demilitarization of Outer Space is not addressed in the subsequent three agreements on space-related activities: the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space,[40] the 1972 Convention on International Liability for Damage Caused by Space Objects[41] and the 1974 Convention on Registration of Objects Launched into Outer Space.[42] However, these treaties all promote international cooperation in the peaceful exploration and use of outer space.

In addition, the legal regime for the demilitarization of outer space has been expanded to include provisions of other multilateral and bilateral international agreements related to disarmament. For example, the 1977 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques applies and "refers to any technique for changing – through the deliberate manipulation of natural processes – the dynamics,

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[37] *See generally* Bin Cheng, *Le Traite de 1967 sur l'espace*, 36 J. DU DROIT INT'L 608 (1968).

[38] The Antarctic Treaty art. 1, Dec. 1, 1959, 12. U.S.T. 794, 42 U.N.T.S. 71.

[39] *See* Cheng, *supra* note 37.

[40] 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.

[41] Convention on the International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187. The possibility of applying the concept of absolute liability adopted by this Convention in order to compensate for damage to targets located on Earth and in airspace as a result of military attacks from weapons deployed in space has been discussed. We should agree with Professor Sa'id Mosteshar that the concept of absolute responsibility applies to belligerents only in cases of damage caused in violation of international humanitarian law. *See* Sa'id Mosteshar, *Space Law and Weapons in Space*, OXFORD RSCH. ENCYCLOPEDIA - PLANETARY SCI. (May 23, 2019), https://oxfordre.com/planetaryscience/view/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-74.

[42] Registration of Objects Launched into Outer Space, Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15.

composition or structure . . . of outer space."[43] The Convention prohibits the use of environmental modification techniques for military purposes.[44] Additionally, a number of provisions on the restriction of military activities in outer space were contained in the Soviet-American agreements in the field of disarmament. For example, the USSR-US Strategic Arms Limitation Treaty of 1979 (SALT II) established a ban on partially orbiting missiles, that is, missiles that do not follow an orbital trajectory, but are placed in and removed from orbit in order to strike an object on Earth.[45] While SALT II has not entered into force, the treaty was actually executed by the parties, evincing an international recognition of disarmament interests. For its part, the 1972 Treaty on the Limitation of Anti-Ballistic Missile Systems obligated the parties not to create, deploy or test anti-ballistic missile systems as space-based components.[46]

The provisions on the demilitarization of the Moon and other celestial bodies established in the Outer Space Treaty were substantially developed in the Agreement Concerning the Activities of States on the Moon and Other Celestial Bodies of December 5, 1979[47] (Moon Agreement). In particular, the Moon Agreement significantly expands the requirements for demilitarization set out in Article IV(2) of the Outer Space Treaty.[48] First of all, the Preamble notes the desire of the parties to the Moon Agreement to prevent the Moon "from becoming an area of international conflict."[49] Article 2 of the Moon Agreement emphasizes that activities on the Moon, including its exploration and use, are

> [C]arried out in accordance with international law, in particular the UN Charter, and taking into account the Declaration on Principles of International Law concerning Friendly

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[43] Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques art. II, Dec. 10, 1976, 1108 U.N.T.S. 151, 31 U.S.T. 333.

[44] *Id.* at art. I.

[45] Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Strategic Offensive Arms (SALT II), U.S.-U.S.S.R., June 18, 1972, S. TREATY DOC. NO. 96-1 (1979), 18 I.L.M. 1138.

[46] Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems art. V, U.S.-U.S.S.R., May 26, 1972, 23 U.S.T. 3435, 944 U.N.T.S. 13 (entered into force Oct. 3, 1972).

[47] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement].

[48] Outer Space Treaty, *supra* note 1, art. IV.

[49] Moon Agreement, *supra* note 47, Preamble.

> Relations and Cooperation among States in accordance with the UN Charter, adopted by the UNGA on 24 October 1970, in the interests of maintaining international peace and security and promoting international cooperation and understanding, and with due regard to the relevant interests of all other States parties.[50]

Thus, the relevant provisions of the UN Charter prohibiting the use of force or the threat of force[51] on the Moon and other celestial bodies should be understood in accordance with the provisions of the 1970 Declaration on Principles of International Law.[52]

Article 3 of the Moon Agreement repeats the provisions of the Outer Space Treaty on the neutralization and demilitarization of the territory of this natural satellite of the Earth.[53] The provision on the use of the Moon exclusively for peaceful purposes is confirmed, which underlines the importance of this element of its international legal regime.[54] The Article specifically mirrors the provisions of Article IV of the Outer Space Treaty prohibiting the creation of military bases, structures and fortifications on celestial bodies, testing of any type of weapons and conducting military maneuvers.[55] It confirms the permissibility of using military personnel for scientific research or any other peaceful purposes, as well as the use of any equipment or facilities necessary for peaceful research, not only as provided for in Article IV of the Outer Space Treaty, but also for the use of the Moon.[56] This last clarification seems logical, especially in light of the planned lunar missions in the coming decade.

The nuclear-free regime of outer space has been further developed. States parties have undertaken not to place objects containing nuclear weapons or any other WMD in orbit around the Moon

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[50] Moon Agreement, *supra* note 47, art. 2 (citations omitted). The Declaration on Principles of International Law concerning Friendly Relations and Cooperation among States in accordance with the UN Charter, adopted by the UNGA on 24 October 1970 can be found at G.A. Res. 2625 (XXV) (Oct. 24, 1970).

[51] U.N. Charter art. 2.

[52] G.A. Res. 2625 (XXV) (Oct. 24, 1970).

[53] Moon Agreement, *supra* note 47, art. 3.

[54] *Id.* at art. 3(1).

[55] *Id.* at art. 3(3)-(4); Outer Space Treaty, *supra* note 1, art. IV.

[56] Moon Agreement, *supra* note 47, art. 3(4).

or on any other flight path to or around the Moon, nor to install or use such weapons on the surface of the Moon or in its interior.

At the same time, the demilitarization regime of the Moon is supplemented by important provisions prohibiting the threat or use of force or any other hostile action or threat to commit hostile actions on it. The concept of prohibiting the threat or use of force in outer space is consistent with the position set out in the Russian-Chinese joint draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Use of Force or the Threat of Force Against Space Objects[57] (PPWT), but does not coincide with it word for word.[58] The Moon Agreement also prohibits the use of the Moon to perform any hostile actions or use any threat of hostile action against the Earth, the Moon, spacecraft, spacecraft personnel or artificial Space objects.[59] These restrictions and prohibitions allow States to avoid possible conflicts when conducting research and developing natural resources on the Moon, which may become a reality in the very near future.

However, the authority of the established international legal regime for the demilitarization of the Moon, its orbit or other flight path to or around the Moon is weakened not by the quality of the legal language used, but by the small number of States participating in the Moon Agreement (eighteen States have ratified or acceded, and four States have signed, among the latter include two spacefaring powers – France and India).[60] It is the author's view

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[57] Draft Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force Against Outer Space Objects, Feb. 12, 2008. The Russian Federation and China jointly submitted this document to the Conference on Disarmament (CD) in Geneva. In June 2014, Russia and China submitted an updated draft of the PPWT to the CD, taking into account the proposals made by interested States since its introduction. Draft Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force Against Outer Space Objects, June 10, 2014. The draft can be found at: reachingcriticalwill.org/images/documents/Disarmament-fora/cd/2014/documents/PPWT2014.pdf [hereinafter PPWT 2014].

[58] The "use of force" or "threat of force" in the updated draft of the 2014 PPWT refers to any deliberate action aimed at causing damage to a space object under the jurisdiction and/or control of other States, or an explicit intention to commit such an action in writing, orally or in any other form. Actions in accordance with separate agreements signed with such States that provide for actions to terminate the unguided flight of a Space object under their jurisdiction and/or control at the request of such States cannot be regarded as the use of force or the threat of force. PPWT 2014, *supra* note 57, art. I(d).

[59] Moon Agreement, *supra* note 47, art. 3(2).

[60] *See* STATUS OF INTERNATIONAL AGREEMENTS RELATING TO ACTIVITIES IN OUTER SPACE AS AT 1 JANUARY 2020, U.N. OFF. OUTER SPACE AFF. (2020),

that the reasons for such a narrow circle of participants in the Moon Agreement are due to the lack of balance in the positions of the States involved in its preparation on the key issue of the legal regime of the Moon's resources. The legal regime of the Moon and other celestial bodies was established at the insistence of developing countries. According to Article 11 of the Moon Agreement, the Moon and other celestial bodies, as well as their natural resources, are the "common heritage of [hu]mankind," and the exploitation of such resources should be regulated by an international regime (including appropriate procedures), which States will establish when it is obvious that such exploitation will become possible in the near future.[61] Moreover, the main goals of the future international regime listed in Article 11 are not supported by the industrialized countries.[62]

It follows that the reasons for the non-participation of the leading spacefaring powers in the Moon Agreement lie in a different plane than the demilitarization of the Moon and other celestial bodies. However, we cannot ignore the fact that, unlike the other four space treaties, the Moon Agreement has not yet become universal, which is becoming the subject of expert discussions about finding acceptable solutions.[63]

IV. PROSPECTS FOR STRENGTHENING THE DEMILITARIZATION OF OUTER SPACE REGIME

The legal basis of the international legal regime for the demilitarization of outer space has undergone certain metamorphoses in the last decades of the twentieth century and in the twenty-first century. In the period of the 1960s-1970s, the main means of its

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https://www.unoosa.org/documents/pdf/spacelaw/treatystatus/TreatiesStatus-2020E.pdf.

[61] Moon Agreement, *supra* note 47, art. 11.

[62] *Id.* at art. 11(7). *See also* P.A. Berkman et al., *Russia-United States Common Challenges and Perspectives,* 1 MOSCOW J. INT'L L. 16, 24 (2018) (analyzing the international legal regime of resources of the Moon and celestial bodies established by the Moon Agreement from the point of view of Russian and American legal doctrines).

[63] A number of experts consider it necessary to revise this agreement in accordance with a 1994 revision of the UN Convention on the Law of the Sea of 1982. *See* Gennady P. Zhukov, *Mezhdunarodnoe Pravo i Vyzovy XXI Veka* [*International Space Law and Challenges of the 21st Century*], *in* MEZHDUNARODNOE PRAVO: UCHEBNIK DLIA ASPIRANTOV [INTERNATIONAL LAW: TEXTBOOK FOR GRADUATE STUDENTS] 430 (A.K. Abashidze ed., 2018).

formation was the treaty regulation of either acts of international disarmament law or international space treaties. At the same time, UNGA resolutions on space activities were assigned the role of secondary, auxiliary regulators that form the contours of future treaty norms. Since the beginning of the 1980s, the situation has changed, and the international treaty has become a tool for developing bilateral and multilateral cooperation between States in the field of space exploration. At the universal level, there is an expansion of the significance of the UNGA resolutions, which formed the main tracks for preventing the militarization of outer space.

In parallel, there are examples of the development of "soft regulation" documents, which are aimed not at achieving the goal of carrying out space activities "exclusively for peaceful purposes," but at improving the security conditions in outer space. The European Union (EU) introduced a draft Code of Conduct in 2008.[64] It notes that the draft Code contains fundamental rules that should be observed by all States conducting space activities to, among other things, prevent an arms race in outer space.[65] In addition, it is aimed at reducing the risk of collisions and the appearance of space debris, as well as strengthening mutual understanding between States engaged in space activity.[66]

At the same time, there are initiatives to further strengthening the Treaty framework for the demilitarization of outer space. In particular, the Russian Federation prefers the formation of a Treaty-based legal mechanism for ensuring the safety of space activities and preventing an arms race in Outer Space. We are talking about promoting the initiative of the above-mentioned Russian-Chinese PPWT, which provides for a ban on the placement of weapons of any kind in space and on any use of force against space objects.[67]

From the point of view of the logic of preventing an arms race in outer space, it looks like a consistent continuation of the regime of partial demilitarization of outer space already enshrined in

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[64] EUROPEAN UNION - EUROPEAN EXTERNAL ACTION SERVICE, DRAFT INTERNATIONAL CODE OF CONDUCT FOR OUTER SPACE ACTIVITIES (Mar. 31, 2014), http://www.eeas.europa.eu/archives/docs/non-proliferation-and-disarmament/pdf/space_code_conduct_draft_vers_31-march-2014_en.pdf.

[65] *Id.* at Preamble.

[66] *Id.* at arts. 4-5. *See* Zhukov, *supra* note 63, at 418.

[67] *Id.* at 407-18.

international space law.[68] The extension of the ban on the deployment of any weapons in outer space, not just nuclear weapons or WMD, meets modern realities. A special international treaty prohibiting the use of force or the threat of force against space objects in addition to the mandatory requirements of Article 2 of the UN Charter[69] also deserves support. The solidification and development of the non-use of force or the threat of force in relation to objects located in outer space is quite justified, since this would be the first concrete step towards a legal settlement of the threat of using anti-satellite systems that concerns most spacefaring States. Such a step, which is legitimate from the point of view of Article 1(4) of the UN Charter, would significantly improve the atmosphere of distrust that currently reigns in relations between the leading space powers.[70]

Without detracting from the importance of "soft regulation" tools for ensuring the security of States' space activities, I present a number of considerations on the need and urgency of a contractual method for strengthening the demilitarization and weaponization of outer space. First of all, support should be given to the claim that the current Outer Space Treaty of 1967 in terms of the ban on the deployment of nuclear and other weapons of mass destruction, it has been a very effective obstacle to an arms race in outer space. Indeed, no violations of the regime established by Article IV of the Outer Space Treaty have been observed during its operation. Moreover, despite some doubts about its potential for future regulation of space activities,[71] a significant number of international lawyers give it a high assessment.[72]

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[68] Outer Space Treaty, *supra* note 1, art. IV; Moon Agreement, *supra* note 46, arts. 2-3.

[69] *See* U.N. Charter art. 2.

[70] *Id.* at art. 1, ¶ 4 ("To be a center for harmonizing the actions of nations in the attainment of these common ends.").

[71] Ram S. Jakhu, *Dogovoru po Kosmosu 1967 Goda Ispolni͡aetsi͡a 40 Let* [*The 1967 Outer Space Treaty at its 40th Anniversary*], *in* SOVREMENNYE PROBLEMY MEZHDUNARODNOGO KOSMICHESKOGO PRAVA [MODERN PROBLEMS IN INTERNATIONAL SPACE LAW] 202-03 (Gennady Zhukov & Anatoly Kapustin eds., 2008).

[72] Some scholars call it the Constitution of Outer Space. *See* M.T. Andem, *Договор по космосу 1967 года как Великая хартия современного космического права: краткое размышление* [*The 1967 Outer Space Treaty as the Magna Carta of Contemporary Space Law: A Brief Reflection*], *in* SOVREMENNYE PROBLEMY MEZHDUNARODNOGO KOSMICHESKOGO PRAVA [MODERN PROBLEMS IN INTERNATIONAL SPACE LAW] 177 (Gennady Zhukov & Anatoly Kapustin eds., 2008); Jakhu, *supra* note 71.

Professor Zhukov notes that "the Outer Space Treaty is the most successful product of law-making within the framework of the United Nations in the twentieth century,"[73] which gives grounds for confidence that in the foreseeable future it will play a fundamental role in maintaining international law and order in outer space. The Outer Space Treaty with regard to the development of the provisions of Article IV, as shown by the Moon Agreement, does not create obstacles to the expansion and strengthening of the demilitarization regime on the Moon and celestial bodies and can serve as the basis for the further development of this regime in orbit around the Earth or anywhere in outer space, or on any celestial body other than the Earth.

We should agree that the importance of the treaty settlement of space weapons increases due to the lack of international legal guarantees not to launch weapons into space. In addition, the lack of such guarantees contributes to increasing uncertainty about the strategic capabilities and intentions of the space powers, which are increasing in number. The deployment of non-WMD weapons in outer space would have a global area of operation, high readiness for use, and the ability to covertly affect and disable space and ground objects. It would become a weapon of real use, generate suspicion and tension in relations between States, and disrupt the climate of mutual trust and cooperation in peaceful space exploration.[74]

Finding a solution to the potential problem of deployed weapons in outer space, and prohibiting the use or threat of force against space objects, are not the only way to strengthen the long-term sustainability of space activities. This question deserves a separate study. It is important to emphasize that such efforts are consistent with both the basic principles of international law and the UN Charter, as well as the goals of peaceful and safe space activities.

Of course, the choice of one or another method of legal settlement of the problem is not a panacea for the risks and threats that exist in inter-State relations in outer space. However, a violation of an international treaty entails international responsibility not only on the basis of international space law, but also by virtue of general

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[73] Zhukov, *supra* note 63, at 418.

[74] *See id.* at 406-07.

international law. This fact can play a role in making foreign policy decisions by individual States.

V. CONCLUSION

An analysis of the formation and development of international legal regulation of the establishment of the demilitarization regime in outer space shows that this process began with the inclusion of relevant provisions in treaties on the control of nuclear weapons and other types of WMD. Initially, the UNGA resolutions devoted to the development of goals and principles for regulating the behavior of States in outer space were silent on "disarmament" issues. However, the Outer Space Treaty established a mandatory regime for the partial demilitarization of outer space and the complete demilitarization of the Moon and other celestial bodies. The Moon agreement has reinforced this positive trend, although it has not gained universal significance

At present, efforts to prevent an arms race in outer space are a key focus of the world community's attention. In this regard, the UNGA attaches great importance to transparency and confidence-building measures in outer space, as well as to further practical measures to prevent an arms race in outer space, and, indeed, to prevent the first deployment of space weapons. UNGA resolution 74/34, "Further practical measures for the prevention of an arms race in Outer Space," of 12 December 2019, recognizes that although existing international treaties relating to the outer space legal regime play a positive role in regulating space activities, they are not able to completely prevent the deployment of weapons in outer space.[75] Thus, the existing treaty regime is incapable of preventing an arms race in outer space, and there is a need to strengthen and consolidate this regime. As a result of the study, it was concluded that the most optimal and reliable means of achieving the goal of keeping outer space peaceful and demilitarized is the development of an appropriate international Treaty better regulating outer space weapons, a draft of which was proposed jointly by Russia and China.[76]

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[75] G.A. Res. 74/34 (Dec. 12, 2019).

[76] *See* PPWT 2014, *supra* note 57.

RECENT SPACE REFORMS IN INDIA: PERSPECTIVES ON POLICY AND LAW

Ranjana Kaul[*]

ABSTRACT

In an unexpected development, in June 2020, Prime Minister Modi announced the decision to "unlock" the potential of the Space sector, by leveraging India's advanced space capabilities. The decision, he said, was in line with the long-term vision of his government to make the country *Atmanirbhar*, or self-reliant. Essentially, the decision signals the partial deregulation of the space sector. The principal pillar of the reforms is to encourage participation of private sector companies within the entire range of space activities. The Department of Space (DoS), the nodal administrative authority in charge of the national space program for the past fifty years, has been directed to deliver the reforms on the ground, through the Indian National Space Promotion and Authorization Center (IN-SPACe), its newly established special purpose entity. The early beneficiaries will likely be India's NewSpace companies. The first obvious challenge will be to bridge the seemingly widening gap between the government and private companies, which is exacerbated by current regulations and policies as well as institutional and management mechanisms. The key to "unlocking India's potential in Space sector"[1] is to frame a regulatory ecosystem consisting of transparent, user-friendly and balanced policies, procedures and laws, without hidden entry barriers and distortions. This paper focuses on a critical and spherical evaluation of the current policy and regulatory frameworks that regulate the Indian space sector to

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[1] *See Unlocking India's Potential in Space Sector as Approved by the Union Cabinet on 24 June 2020,* PARABOLICARC.COM (July 31, 2020), *http://www.paraboli-carc.com/2020/07/31/unlocking-indias-potential-in-space-sector/*.

identify the roadblocks and suggest some legal and policy prescriptions that may support India's space reforms.

I. INTRODUCTION

On June 24, 2020, Prime Minister Modi announced the decision[2] to reform the Space sector by harnessing private sector participation in the entire range of space activities. The Cabinet Note on Space Reforms, he said, was in line with the long-term mission of transforming the country into a technologically advanced, industrially robust and *Atmanirbhar* Bharat (self-reliant India).[3] The objective is to be achieved by leveraging India's advanced space capabilities in facilitating private sector participation through friendly regulatory environment and encouraging policies.[4] The Indian National Space Promotion and Authorisation Centre (IN-SPACe) was created in conjunction with the space reforms announcement with the sole purpose of facilitating private company participation in space activities.[5] IN-SPACe, will be an autonomous entity which

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[2] Zee Media Bureau, *Reforms in Space Sector Get Cabinet Nod to Boost Private Sector Participation*, ZEE NEWS (updated June 24, 2020), https://zeenews.india.com/india/reforms-in-space-sector-get-cabinet-nod-to-boost-private-sector-participation-2291730.html. *See also* Narendra Modi (@narendramodi), TWITTER (June 24, 2020, 6:35AM) https://twitter.com/narendramodi/status/1275754344843866113?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1275754344843866113%7Ctwgr%5Eshare_3&ref_url=https%3A%2F%2Ftimesofindia.indiatimes.com%2Findia%2Funion-cabinet-approves-setting-up-of-in-space-a-new-space-board%2Farticleshow%2F76554135.cms.

[3] *See* Zee Media Bureau, *supra* note 2. *See also* Press Release, Ministry of Home Affairs (June 24, 2020), https://pib.gov.in/PressReleasePage.aspx?PRID=1634061 [hereinafter PIB Delhi]; Amit Shah (@AmitShah), TWITTER (June 24, 2020, 8:12 AM). https://twitter.com/AmitShah/status/1275778420236890112?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1275778420236890112%7Ctwgr%5Eshare_3&ref_url=https%3A%2F%2Fpib.gov.in%2FPressReleasePage.aspx%3FPRID%3D1634061; Amit Shah (@AmitShah), TWITTER (June 24, 2020, 8:13 AM) https://twitter.com/AmitShah/status/1275779078046408704?ref_src=twsrc%5Etfw%7Ctwcamp%5Etweetembed%7Ctwterm%5E1275779078046408704%7Ctwgr%5Eshare_3&ref_url=https%3A%2F%2Fpib.gov.in%2FPressReleasePage.aspx%3FPRID%3D1634061.

[4] *See* Zee Media Bureau, *supra* note 2.

[5] *See* PIB Delhi, *supra* note 3. *See also* Gopi, *'Towards Atmanirbhar Bharat': Shah on Cabinet Decisions*, SOCIALNEWS.XYZ (June 24, 2020), https://www.socialnews.xyz/2020/06/24/towards-atmanirbhar-bharat-shah-on-cabinet-decisions/.

will function under the administrative control of the Department of Space (DoS).[6]

More than likely, the early beneficiaries of the reforms will be the fifty private space companies, mostly around Bangalore, Hyderabad, Chennai and Mumbai, which have formed in the last ten years. This is India's NewSpace.[7] Indeed, earlier on May 16, 2020, at a press conference, Finance Minister Nirmala Sitharaman acknowledged their presence and stated that the government intended "[t]o provide a level playing field . . . predictable policy and regulatory environment" and a new geospatial policy.[8] Finance Minister Sitharaman's address was tacit acceptance that the existing regulatory framework for the space sector is unfavourable and an impediment for the reforms process.

Predictably, India's NewSpace is hopeful, but also sceptical.[9] Concerns about the inherent conflict of interests are paramount. After all, India's national space activities and delivery of space-based services have until now been the exclusive remit of the DoS. NewSpace is the only gateway for a private company to participate in space activities. Furthermore, the June 24, 2020 Cabinet Note on Space Reforms only contains the broad objectives to be achieved through private sector participation in space sector activities, which is duly facilitated by IN-SPACe.[10] DoS is tasked to flesh out the details and contours of an enabling space reforms policy and supporting legal framework.

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[6] *See IN-SPACe*, GOV'T OF INDIA: DEP'T OF SPACE INDIAN SPACE RES. ORG., https://www.isro.gov.in/indian-national-space-promotion-and-authorization-center-space (last visited Nov. 9, 2020) [hereinafter *IN-SPACe*]. For a detailed description about the Department of Space and the Indian Space Research Organization (ISRO) Head, visit *Department of Space and ISRO HQ*, GOV'T OF INDIA: DEP'T OF SPACE INDIAN SPACE RES. ORG., https://www.isro.gov.in/about-isro/department-of-space-and-isro-hq (last visited Oct. 2, 2020).

[7] *See* Narayan Prasad Nagendra, *Space 2.0 India: Leapfrogging Indian Space Commerce*, OBSERVER RES. FOUND. (Feb. 28, 2017), https://www.orfonline.org/expert-speak/space-india-leapfrogging-commerce/.

[8] ET Bureau, *ISRO Facilities to Open for Start-ups, Private Firms; Wew Geospatial Policy Soon*, THE ECON. TIMES (last updated May 16, 2020), https://economictimes.indiatimes.com/news/science/isro-facilities-to-open-for-startups-private-firms-new-geospatial-policy-soon/articleshow/75776524.cms.

[9] *See generally* Ashok G.V., *If IN-SPACe Is the Answer, What Is the Question, and Why Should You Care?*, SCIENCE: THE WIRE (June 29, 2020), https://science.thewire.in/space/isro-in-space-commercial-space-regulations-satcom-policy/.

[10] Zee Media Bureau, *supra* note 2.

Indisputably, DoS is the most affected party. After fifty years, the Department must now re-configure its institutional and activities profiles to accommodate NewSpace. Now, DoS must properly review its current statutory framework – both in respect to the space and ground segment activities - to strengthen it, where required, in anticipation of its role as the regulator for space activities undertaken by Indian non-governmental entities (private space companies). Clearly, DoS holds the Rosetta Stone that will unlock the full potential of India's space sector. Success is the only option, but how can this be achieved? What are the next steps?

The main focus of this article is to undertake a spherical and comprehensive examination of the policy and regulatory environment of the Indian spaces sector. It will try to identify existing gaps and roadblocks that prevent or discourage private companies from participating in space and ground segment activities, except as a sub-contractor to DoS or the Indian Space Research Organization (ISRO)[11] as suppliers of goods and services required for space missions.

The article is presented in three parts. Part II discusses existing challenges for drafting an appropriate space reforms policy and offers suggestions regarding existing policies that ought to be appropriately restated or amended to facilitate the reforms process. This section presents a spherical analysis, using Professor Bin Cheng's approach, to examine the legal status of India's State Practice, which governs space segment activities in the context of the international space treaty regime. Part II will try to identify regulatory gaps that must be strengthened in anticipation of private companies being permitted to undertake activities in outer space.

Part III addresses the reforms from the policy perspective, presenting an overview of the national space program, including the organization and decision-making processes related to space activities. Specifically, this section addresses the reforms from the policy perspective in relation to national space activities conducted by DoS or ISRO.

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[11] For a detailed description of India's national space program and ISRO's history and current activities, see *About ISRO*, GOV'T OF INDIA: DEP'T OF SPACE INDIAN SPACE RES. ORG., https://www.isro.gov.in/about-isro (last visited Oct. 2, 2020). For ISRO's Annual Report, see GOV'T OF INDIA: DEP'T OF SPACE, ANNUAL REPORT 2019-2020, https://www.isro.gov.in/sites/default/files/flipping_book/annual_report_2019-20_english/index.html.

Lastly, Part IV will examine ground segment reforms from the legal perspective, including context to private sector participation that is independent and de-linked from the DoS or ISRO procurement contracts regime. The legal perspectives will be referenced, where necessary, to the draft Space Activities Bill 2017[12] which is said to be under consideration by DoS.

The article will then end with a few concluding remarks.

II. CURRENT STATE OF AFFAIRS IN INDIAN SPACE LAW

A. Space Reforms Policy - Partial Deregulation

In response to Prime Minister Modi's June 24, 2020 Space Sector Reforms announcement, Union Minister Jitendra Singh explained that that IN-SPACe will "play a supplementary role" to ISRO to "harness space technology for national development while pursuing space science research and planetary exploration."[13] Prime Minister Modi also confirmed that the reforms were "aimed at boosting the private sector's participation in the entire range of space activities"[14] which appears to signal, albeit not specifically state, the partial de-regulation of India's publicly funded space sector. The experience is not new for the government. The New Economic Policy 1991(NEP '91) liberalized India's economy by undertaking structural changes and partially de-regulating almost all sectors to allow private sector participation.[15] The space sector, among others, was not deregulated and remains an exclusive government remit. Arguably, it will be useful to recall the challenges and difficulties around reconciling competing interests of the incumbent entities and private sector. These issues include, but are not limited to: extensive stakeholder consultations; consultation

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[12] GOV'T OF INDIA: DEP'T OF SPACE INDIAN SPACE RES. ORG., SEEKING COMMENTS ON DRAFT "SPACE ACTIVITIES BILL, 2017" FROM THE STAKE HOLDERS/PUBLIC-REGARDING (Nov. 21, 2017), https://www.isro.gov.in/update/21-nov-2017/seeking-comments-draft-space-activities-bill-2017-stake-holders-public-regarding [hereinafter Draft Space Activities Bill].

[13] Hindusthanlivee, *Cabinet Nod for Private Sector in Space – India News*, HINDUSTHANLIVE.COM (June 24, 2020), https://hindusthanlive.com/cabinet-nod-for-private-sector-in-space-india-news/.

[14] *Id.*

[15] Arvind Panagariya, *India in the 1980s and 1990s: A Triumph of Reforms* 23 (Int'l Monetary Fund, Working Paper No. WP/04/43, 2004), https://www.imf.org/external/pubs/ft/wp/2004/wp0443.pdf.

papers and revisions; and ultimately, the policy-regulatory outcomes, sometimes imperfect, which set India on the path to exponential economic development. The clear take away suggests that the onus to reconcile the inherent conflict of interests within the incumbent DoS (including ISRO, Antrix Corporation Limited[16] (Antrix) and New Space India Limited[17] (NSIL)) with the aspirations of NewSpace, and also to frame an enabling space reforms policy, including procedures to propel the reforms forward, should not be solely imposed on the DoS. In the interests of efficiency, transparency and as a confidence building measure, the space reforms policy process should be a transparent collaborative effort, which must be undertaken with due care by the government of India through a collaborative mechanism.

Having said that, it is paramount to bear in mind that, unlike in 1991, the partial deregulation of the space sector has a fundamental and unique dimension. Thirty years ago, the deregulation of publicly funded government entities was opened for private sector participation under NEP'91 and accompanying Foreign Direct Investment Policy.[18] Under these policies, India saw the birth of a new generation of entrepreneurs who entered into joint ventures with global companies, taking advantage of access to capital and technology knowhow as well as operational and managerial expertise. The NEP'91 linked India into the global value chain. Today, these Indian companies have international business operations ranging from telecom and civil aviation to offshore oil exploration

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[16] Antrix Corporation Limited was established in 1992 as the marketing arm of ISRO for promotion and commercial exploitation of space products, technical consultancy services and transfer of technologies developed by ISRO, including space related services like remote sensing data service, transponder lease service; launch services through the operational launch vehicles (PSLV and GSLV) and mission support services, among others. *Antrix Corporation Limited*, GOV'T OF INDIA: DEP'T. OF SPACE INDIAN SPACE RES. ORG., https://www.isro.gov.in/about-isro/antrix-corporation-limited (last visited Oct. 2, 2020).

[17] New Space India Limited was established in 2019 with a business portfolio which includes the production of the PSLV and SSLV launch vehicles, launch services, satellite-based services, satellite building and sub systems, among others. *NewSpace India Limited*, GOV'T OF INDIA: DEP'T. OF SPACE INDIAN SPACE RESEARCH ORG., https://www.isro.gov.in/about-isro/newspace-india-limited-nsil (last visited Oct. 2, 2020).

[18] *See* GOV'T OF INDIA: MINISTRY OF COM. & INDUSTRY DEP'T OF INDUS. POL'Y & PROMOTION, F. NO. 5(1)/2017-FC-1, CONSOLIDATED FDI POLICY CIRCULAR OF 2017 (Aug. 28, 2017), https://dipp.gov.in/sites/default/files/CFPC_2017_FINAL_RELEASED_28.8.17.pdf.

and hotels, and across sectors. Private companies benefitted and many now are global companies. The recent sale of OneWeb to the UK-Bharti Group is a timely example.[19]

In 2020, NewSpace is already established and engaged in space sector activities. These private companies are driven by innovation and new and efficient technology developments. This is India's NewSpace.[20] Presently, NewSpace consists of approximately fifty nascent private space companies that have developed in the last decade or so. These are self-motivated, young space innovator-entrepreneurs who have, despite the absence of start-up support programs in India, raised finance from their own means and resources. These sources include investment from private sector investors on the promise their products and services will have potential in both domestic and global markets. NewSpace does not have direct engagement with ISRO through its official procurement route, although it may leverage some existing ISRO vendor base to support its own activity. These companies are trying to develop new intellectual property in products and services as well as designing end-to-end service solutions across the value chain. Those solutions include, but are not limited to, design and manufacture of launch vehicles, mobile launch platforms, satellites, electric propulsion systems for satellites, space-based application services, big data analytics and e-marketplace portals to connect buyers and suppliers in the global space industry. For NewSpace, time is of the essence. As such, NewSpace is mindful of running tight efficient operations, and has concerns around time-lines, innovation, technology and development, human resources, market access, accounts, balance sheets and rate of return. Above all, NewSpace has the will to succeed and make a difference, ideally, in India. NewSpace has first-hand experience of the current unfavorable regulatory environment and understands the limitations on its ability to mature its ambition in India. The absence of a timely roll out of meaningful reforms in space policy with supporting regulatory framework will leave few compelling reasons to keep these companies confined to India. Indeed, a few have already established an international footprint in countries which have policies to leverage the potential of space

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[19] *See, e.g.*, Jonathan Amos, *OneWeb Sale to UK-Bharti Group Gets Court Approval*, BBC (July 10, 2020), https://www.bbc.com/news/science-environment-53370930.

[20] Nagendra, *supra* note 7.

technologies and invite new companies to support their economic expansion in the coming decades.

The ideal prescription is for a careful and objectively structured space reforms policy, without hidden roadblocks and other barriers to entry. Such a space reforms policy would be framed in a thirty years timeframe with an accompanying roadmap for implementation. The critical challenge will be to provide timely on-ground delivery of the reforms. Nothing can succeed without the support of easy to access procedures accentuated by a transparent, fair and responsive institutional and managerial approach.

Arguably, desired policy outcomes will be best possible through active collaboration and coordination between related government entities so that a space reforms policy can be seamlessly harmonized with other applicable policies and statutes, *ab initio*. Ideally, policy makers should be drawn from across government, including but not limited to DoS, Ministries of Finance, Commerce & Industry, Defense, External Affairs, Science & Technology, Department of Telecom, Electronics & IT, Earth Sciences, Law & Justice, and non-government representatives including NewSpace as well as experts in law of outer space, general international law and domestic laws.[21]

In any event, it is indisputable that comprehensive and reliable data sets on the Space sector, national and NewSpace, will be indispensable tools for the space reforms policymakers. These data sets will help policymakers, understand the ground realities, facilitate realistic projections and milestones and clearly state outcome objectives for this strategically important sector. Given that the government and most policymakers in India are unfamiliar with the space economy, *per se*, and NewSpace in particular, it would be useful to invite written submissions from the private space companies. Such submissions should be tailored to the area of expertise and products, specific regulatory roadblocks encountered, and such other information that the company may wish to provide.

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[21] *See* Sandhya Ramesh, *This is How Govt Plans to Bring Together ISRO, Private Players to Boost India's Space Sector*, THE PRINT (Aug. 20, 2020), https://theprint.in/india/governance/this-is-how-govt-plans-to-bring-together-isro-private-players-to-boost-indias-space-sector/486001/; Rajeswari Pillai Rajagopalan, *India's Space Programme: A role for the Private Sector, Finally?*, SCIENCE: THE WIRE (May 22, 2020), https://science.thewire.in/space/nirmala-sitharaman-indian-space-programme-isro-private-sector/.

i. Data Sets

As far as the author is aware, the following targeted data sets are not available in the public domain. This is a representative list of reliable data sets and information that should be made available to the drafters of the space reforms policy.

a. Data on the Space Economy[22] *1990-2000*

(1) The size of India's space economy in terms of how much the government has invested or spent on national space activities, in at least in the last thirty years, 1990 to 2020, if not since inception in 1972.

(2) A comprehensive mapping of the overall ecosystem in terms of industry involvement in the procurement system through which DoS or ISRO procure the required good and services for the space program or others;

(3) The size and scale of spin-offs resulting from the space sector, to date, including as a result of the 2011 Indian Remote Sensing (IRS) Data Policy.[23]

(4) The number of citizens, including commercial and industrial enterprises, using IRS data as per the 2011 IRS Data Policy (excluding non-Indian sources); the impact in terms of job creation, productivity, innovation and applications and contribution to gross domestic product (GDP).

(5) The scale at which India's space assets are being used by its citizens including:

(a) how many users, including fishermen are, using GAGAN and/or NAVIc satellite navigation signals to date;

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[22] *See* Narayan Prasad, Co-founder of Satsearch.co, *Assessing the Indian Government's Reform Initiative to Boost Private Participation in Space Activities*, Webinar Presentation provided by the London Institute of Space Policy and Law (July 28, 2020).

[23] GOV'T OF INDIA, RSDP-2011, REMOTE SENSING DATA POLICY (2011), https://www.indiawaterportal.org/sites/indiawaterportal.org/files/Remote_sensing_data_policy_2011_released_by_ISRO.pdf.

(b) the impact of satellite navigation signals on job creation, productivity, innovation and spin offs and contribution to gross domestic product;

(6) The contribution of satellite telecommunications and broadcasting sectors to job creation, productivity, innovations and spin offs and GDP; and

(7) The contribution of the overall space economy to GDP, job creation and productivity.

b. Data on NewSpace Economy, Across Measurable Parameters[24] (2010-2020)

(1) Current status of NewSpace companies in India including their geographical locations.

(2) Growth trajectory and contribution to GDP in the last ten years.

(3) Mapping of new technology developments, applications and manufacturing capability.

(4) Mapping the international footprint of NewSpace and reasons for relocating businesses to other geographies.

(5) Identification of regulatory and other factors inhibiting growth in India.

(6) Projections for growth, if constraints are removed (i.e. applicable link regulations, procedures, institutional management).

c. Representative List of Existing Policies and Statutes That Act as Entry Barriers

The reforms process must include a thorough examination of existing policies and statutes that are adversely impacting or preventing NewSpace to even use those options that appear to be available on their face. These hidden distortions and entry barriers include the following.

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[24] Prasad, *supra* note 22.

(1) Entry barriers to commercial launch service by domestic private companies.

A significant entry barrier which prevents NewSpace from procuring a commercial space launch in India from ISRO is the 18% Goods & Services Tax (GST)[25] applicable to the service. The increase in transaction cost forces these companies to find cheaper options abroad. In contrast, a commercial launch service provided by Antrix/NSIL to a foreign buyer is classified as a "deemed export," and attracts zero percent GST liability.[26]

In effect, Indian companies face a discriminatory regulatory environment. To facilitate the reforms process, commercial launch services procured from Antrix/NSIL by an Indian company should be put under the GST Exempt Category.

(2) Facilitate linking India to the global value chain in space products.

A comprehensive review of the 1962 Customs Act[27] and rules thereunder must be undertaken, with a view to amend as necessary to facilitate the ability of Indian companies to link into the global supply chain for space products, subject to export control regulations under the SCOMET (Special Chemicals, Organisms, Materials, Equipment and Technologies) List.[28]

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[25] India Const. Art. 246A, amended by The Constitution (One Hundred and First Amendment) Act, 2016.

[26] *See* Directorate of General Taxpayer Services, Central Board of Excise & Customs, *Deemed Exports in GST*, CBIC.GOV, HTTPS://WWW.CBIC.GOV.IN/RESOURCES//HTDOCS-CBEC/GST/DEEMED%20EXPORTS%20IN%20GST.PDF

[27] Customs Act, 1962, No. 52, Acts of Parliament, 1962 (India).

[28] The export of dual-purpose items is permitted only pursuant to an export license. All dual-use items and technologies covered under the SCOMET are classified into eight categories. Categories 4 and 5 contain items like rocket propellants, guidance systems, and several other technologies that are related to the production and guidance of rockets, satellites, missiles, etc. *See ITC HS Code List or India Harmonised Code System Code*, DIRECTORATE GEN. OF FOREIGN TRADE, https://www.dgft.org/itc_hs_code.html (last visited Aug. 12, 2020) (review Schedule 2 to Appendix 3).

(3) Provide one window facility to improve the ease of doing business.

> The current procedural framework requires an applicant to submit different applications to multiple entities to fulfil license, spectrum and satellite capacity requirements, causing delays and hardships for start-ups and NewSpace. The procedural framework includes: (a) an application grant of license from the Department of Telecommunications (DoT), including experimental license;[29] (b) an application for clearance and allocation of required bandwidth/band spectrum from the Wireless Planning & Coordination Wing and Standing Advisory Committee on (Radio) Frequency Allocation;[30] and (c) an application to the Committee for Authorizing the Establishment and Operation of Indian Satellite Systems[31] for transponder capacity in the required bands/frequency on foreign satellites and for experimental licenses granted by the DoT. IN-SPACe should consider a mechanism to provide a single window application clearance.

(4) Self-reliance in the satellite communications infrastructure.

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[29] *See generally, Telecom & Spectrum Licensing,* DEP'T OF TELECOMM., https://dot.gov.in/access-services (last visited Feb. 27, 2020).

[30] *Wireless Planning & Coordination Wing and SACFA*, DEP'T OF TELECOMMS., https://dot.gov.in/spectrum-management/2457 (last visited Aug. 7, 2020).

[31] A POLICY FRAMEWORK FOR SATELLITE COMMUNICATION IN INDIA, COMM. ON AUTHORIZATION OF INDIAN SATELLITE SYS. (CAISS), https://www.isro.gov.in/sites/default/files/article-files/indias-space-policy-0/satcom-policy.pdf (last visited Aug. 5, 2020) [hereinafter A POLICY FRAMEWORK].

(a) National Digital Communications Policy, 2018[32] - aligning the Indian Telegraph Act, 1885[33] and the Indian Wireless Telegraphy Act, 1933.[34]

A critical vertical in commercial space activities is satellite telecommunications and broadcasting. The DoT has already announced the 2018 National Digital Communications Policy (NDCP 2018). [35] However, its complete rollout is predicated on a statutory underpinning through appropriate amendments in the 1885 Indian Telegraph Act and the 1933 Indian Wireless Telegraphy Act. Indeed, this is what was done to support the 1999 New Telecom Policy (NTP'99) which had introduced satellite telecommunications in India. In fact, the 2000 Satcom Policy[36] was approved for implementation by the DoS to provide the requisite space segment support—to fulfil satellite transponder capacity requirements of India's commercial satellite telecommunication and broadcasting sectors and to roll out the NTP'99.

(b) National Digital Communications Policy, 2018 and Satcom Policy, 2000.

As mentioned in the earlier paragraph, a window of opportunity did come up to open the space segment pursuant to introduction of satellite communication in India. The 2000 Satcom Policy permits the establishment of private satellite systems: as a method to add numbers to INSAT satellite systems; and for meeting the ever-increasing demand for transponder capacity from commercial satellite communications and broadcasting sectors. It also, albeit as an

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[32] GOV'T OF INDIA: DEP'T OF TELECOMMS., NATIONAL DIGITAL COMMUNICATIONS POLICY (2018), https://dot.gov.in/sites/default/files/EnglishPolicy-NDCP.pdf [hereinafter NATIONAL DIGITAL COMMUNICATIONS POLICY]. The National Digital Communications Policy calls for enabling infrastructure convergence of IT, telecom, and broadcasting, by: (i) amending the Indian Telegraph Act, 1885 and other relevant acts for the purpose of convergence in coordination with respective ministries; (ii) establishing a unified policy framework and spectrum management regime for broadcast and broadband technologies; and (iii) restructuring of legal, licensing, and regulatory frameworks for reaping the benefits of convergence.

[33] Indian Telegraphy Act, 1885, Acts of Parliament, 1885.

[34] Indian Wireless Telegraphy Act, 1933, No. 17, Acts of Parliament, 1933.

[35] *See* DEP'T OF TELECOMMS., https://dot.gov.in/ (last visited Sept. 28, 2020).

[36] A POLICY FRAMEWORK, *supra* note 31.

> interim measure, permitted leasing transponder capacity on foreign satellites until domestic capacity could be built up. Private companies have not yet been permitted to establish a private communications satellite system.
>
> Meanwhile, as we have noted, DoT has already announced the NDCP 2018 which places more reliance on satellite communications and calls for "strengthening satellite communication technologies in India" in paragraph 1.3.[37] It is self-evident that the space reforms policy must be aligned with the NDCP 2018 if common national goals are to be achieved. Will the space reforms policy implement the strategy to reduce dependence on foreign satellites for transponder capacity, thus making India self-reliant in this strategically critical space-based service?

(c) National Digital Communications Policy and Spectrum.

> The NDCP 2018 addresses critical issues around Spectrum availability and management in paragraph 1.2.[38] It is

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[37] NATIONAL DIGITAL COMMUNICATIONS POLICY, *supra* note 32, at 9. The National Data Communications Policy proposes strengthening satellite communication technologies by: (a) reviewing the regulatory regime for satellite communication technologies, including: (i) revising licensing and regulatory conditions that limit the use of satellite communications, such as speed barriers, band allocation, etc., (ii) simplifying compliance requirements for VSAT operators to ensure faster roll out, and (iii) expanding the scope of permissible services for the effective utilization of High Throughput Satellite systems through appropriate licensing mechanism; (b) optimizing satellite communications technologies in India by: (i) reviewing the SATCOM policy for communication services, along with Department of Space, to create a flexible, technology-neutral and competitive regime, keeping in view international developments and social and economic needs of the country, (ii) making available new spectrum bands (such as Ka Band) for satellite based commercial communication services, (iii) rationalizing satellite transponder, spectrum charges, and charges payable to WPC, and (iv) assessing the bandwidth demands across various spectrum bands used for satellite communications in consultation with stakeholders. *Id.* at 9-10.

[38] *Id.* at 8. The Government recognizes spectrums as a key natural resource for public benefit to achieve India's socio-economic goals, and strives to ensure transparency in allocation, and optimize availability and utilization by: (a) developing a transparent, normative and fair policy for spectrum assignments and allocations; (b) making adequate spectrum available to be equipped for the new broadband era by: (i) identifying and making available new Spectrum bands for Access and Backhaul segments for timely deployment and growth of 5G networks, (ii) making available harmonized and contiguous spectrum required for deployment of next generation access technologies, (iii) further liberalizing the spectrum sharing, leasing and trading regime, (iv) coordinating with Government departments for freeing underutilized/substitutable spectrum, and its assignment along with unutilized spectrum for efficient and productive use, (v) optimally pricing the

understood that timely availability of spectrum, orbital slots and transponder capacity is at the root of unlocking the potential of private space companies, among other important initiatives. Furthermore, the fact that the Wireless Planning & Coordination Wing (WP&C), the spectrum regulator for allocation, functions under the DoT ought to make it easier for WP&C to align with the NDCP 2018.

(5) New Geographic Information System (GIS) Policy - Review of the 2011 IRS Data Policy.[39]

The Finance Minister has promised a new GIS policy.[40] The recognition that the restrictive and opaquely worded IRS Data Policy needs to be replaced with a new GIS Policy has not come a day too soon. Briefly, the 2011 policy is criticized for neither enabling optimal use of these publicly funded Earth Observation (EO) data resources to meet social and developmental objectives nor recognizing current market realities, where transactions involving EO data occur regularly without the role or interference of State intermediaries through the Internet and often at highly subsidised prices.

The problem is that the 2011 IRS Data Policy is administered by the National Remote Sensing Centre (NRSC),[41] but supported by the ISRO, an autonomous entity under

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spectrum to ensure sustainable and affordable access to Digital Communications, (vi) simplifying the process of obtaining permissions from various agencies such as WPC and SACFA in order to promote efficiency, (vii) enabling Light Touch licensing/de-licensing of spectrum for broadband proliferation, (viii) promoting the co-use/secondary use of spectrum, (ix) constituting a Spectrum Advisory Team (SAT) consisting of experts, industry and academia to facilitate the identification of new bands, applications and efficiency measures to catalyze innovation and efficient spectrum management; (c) institute efficient spectrum utilization and management via: (i) ensuring the optimum utilization of spectrum by management of interference free spectrum and encouraging new technologies and consolidation, (ii) monitoring efficient utilization of spectrum by conducting systematic audits of the spectrum allocated to both commercial and government organizations, (iii) deploying dynamic database systems for allocation/interference management, and (iv) publishing annual spectrum utilization and availability roadmap for communication needs including those of aircraft and vessels. *Id.* at 8-9.

[39] *India's Space Policy: Remote Sensing*, GOV'T OF INDIA: DEP'T OF SPACE INDIAN SPACE RES. ORG., https://www.isro.gov.in/indias-space-policy-0 (last visited Oct. 2, 2020).

[40] Amos, *supra* note 19.

[41] GOV'T OF INDIA: NAT'L REMOTE SENSING CTR., https://www.nrsc.gov.in/ (last visited Oct. 2, 2020).

the control of the DoS. Predictably, the institutional approach to remote sensing data distribution is based on a presumption of denial of access to citizens of the publicly funded national resource. In fact, the NRSC *Bhuvan* GIS portal[42] which leans in favour of the government user, makes access cumbersome and complicated for ordinary citizens. It is unfortunate that ease of access makes Google Earth the obvious choice, rather than Bhuvan.

EO data driven business, however, must necessarily obtain EO data from NRSC. Predictably, the institutional mechanism has concentrated the power and function of aggregating and distributing all EO data in the hands of the NRSC and Antrix for high-resolution satellite images, specifically the NRSC High Resolution Image Committee (HRIC). The procedures for trading EO data are cumbersome, involving unacceptable delays, as well as payment of a fee to NRSC in addition to the cost of the EO data purchased. These mechanisms suffer from a lack of transparency and avoid providing a measure of predictability on the success of obtaining EO data from NRSC and HRIC. In sum, the effect is to deter EO-data-based businesses by leaving their legitimacy and legality always open to interpretation.

If a new GIS policy is to genuinely support the space reforms, it must ensure that the institutional approach is based on the presumption of open access. The NRSC should no longer be the nodal distributor for all satellite data. It is expected, that in keeping with international trends, the new policy will provide appropriate interventions to allow up to 50 cm resolution of satellite imagery and to permit purchase directly from satellite data sellers in order to help cut unnecessary transaction costs. Needless to state that satellite data sellers, including their local offices, should necessarily be regulated under appropriate statutory checks, balances, and require compliances, including for example, an audit of transactions.

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[42] *Bhuvan GIS Portal*, GOV'T OF INDIA: NAT'L REMOTE SENSING CTR., https://bhuvan.nrsc.gov.in/bhuvan_links.php# (last visited Oct. 2, 2020) [hereinafter NAT'L REMOTE SENSING CTR.].

III. SPACE REFORMS POLICY PERSPECTIVES

A. National Space Program—Organization and Decision-Making Processes for Space Related Activities

There is no doubt that the inherent conflict of interest between the DoS and its downstream entities, including ISRO, NRSC, Antrix, NSIL and private companies will weigh very heavily on the outcomes of the space reforms and/or space initiative. Arguably, the institutional approach of the incumbent may be the critical key to unlock the potential of the space sector.

The following paragraphs provide a brief overview of the Indian space program under the DoS, relevant statutory and institutional frameworks including IN-SPACe, newly established to facilitate private sector participation in the full range of space activities.

B. Indian Space Program

Recognizing the critical importance of outer space as a tool to accelerate sustainable development of the country, the Indian space program was designed, *ab initio*, as a civil space program. Starting in 1962, under the Department of Atomic Energy, the Indian National Committee for Space Research (INSCOPAR) was established for undertaking research and related activities required for the proposed national space program. In 1969, INSCOPAR metamorphosized into the newly established ISRO. The national space program assists the Government of India to fulfil public obligations including socio-economic development, governance, safety, and security. As such, as with other publicly funded programs, the financial model of the program does not recognize establishment costs or the rate of return considerations.

In the past fifty years, India has developed an extensive and comprehensive space program for peaceful purposes, building a foundation through sustained and systematic development of low cost, indigenous space capabilities. The impressive array of space technology applications initiated by ISRO have met with resounding success enabling India to achieve, in large measure, its objective of applying space science and technology for identified national development objectives. The Indian space program also includes: space science research and development; the indigenous

manufacture of reliable, low cost space launch vehicles; low cost commercial launches of payloads into the polar and geostationary orbits; the manufacture and operation of satellites for advanced communication, metrological data, all weather forecasting, earth observation; the Indian regional navigation satellite system; the successful launch of 104 satellites on the 39th flight of India's Polar Satellite Launch Vehicle (PSLV) in 2017;[43] the lunar *Chandrayaan* missions,[44] the Mars *Mangalyaan* mission,[45] as well as the proposed Indian Human Spaceflight Mission[46] and the Aditya-L1 which will be India's first solar mission to study the sun.[47]

C. Department of Space—Statutory Framework, Organization and Decision-Making Process

The DoS was constituted in 1972, and functions under the direct oversight of the Prime Minister of India, reporting through the Minister of State (Space).[48]

The statutory underpinning related to the establishment of the DoS, its organization, management, decision making and function are provided under the title "*Department of Space (Antriksha Vibhag*)" dated July 18, 1972, contained in the Government of India (Allocation of Business) Rules of 1961.[49]

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[43] *PSLV-C37 Successfully Launches 104 Satellites in a Single a Flight*, GOV'T OF INDIA: DEP'T OF SPACE INDIAN SPACE RES. ORG., https://www.isro.gov.in/pslv-c37-successfully-launches-104-satellites-single-flight (last visited Oct. 2, 2020).

[44] Mike Wall, *India is Officially Going Back to the Moon with Chandrayaan-3 Lunar Lander,* SPACE.COM (Jan. 02, 2020), https://www.space.com/india-confirms-moon-landing-mission-chandrayaan-3.html

[45] Jatan Mehta, *India's Mars Orbiter Completes Six Years at the Red Planet, but Where is the Science?,* THE SPACE REVIEW (Sep. 28, 2020), https://www.thespacereview.com/article/4036/1.

[46] Nell GreenfieldBoyce, *India Announces Plans for its First Human Space Mission,* NAT'L PUBLIC RADIO (Jan. 1, 2020), https://www.npr.org/2020/01/01/792927666/india-announces-plans-for-its-first-human-space-mission.

[47] *India's First Solar Mission,* GOV'T OF INDIA: DEP'T OF SPACE INDIAN SPACE RES. ORG., https://www.isro.gov.in/aditya-l1-first-indian-mission-to-study-sun (last visited Oct. 2, 2020).

[48] For a detailed description of the national space missions and current activities, see *Department of Space and ISRO HQ*, GOV'T OF INDIA: DEP'T OF SPACE INDIAN SPACE RES. ORG., https://www.isro.gov.in/about-isro/department-of-space-and-isro-hq (last visited Oct. 2, 2020). For details about the Department of Space and ISRO Budget, see *Budget at a Glance,* GOV'T OF INDIA: DEP'T OF SPACE INDIAN SPACE RES. ORG., https://www.isro.gov.in/budget-glance (last visited Oct. 2, 2020).

[49] Allocation of Business (95th Amendment) Rules, 1961, Gen. S. R. & O. 498(E).

i. Department of Space—Nodal Authority for Space

The Secretary of the DoS represents the highest level of management and decision-making authority, subject to control of the Office of the Prime Minister.

As such, the DoS exercises administrative control over its downstream entities that are within the scope of the national space program. These entities include the Space Commission of India[50] (space policy matters); ISRO; autonomous entities including satellite centers, space ports, and the NRSC; and two public sector companies that commercialize space-based services—Antrix and NSIL.

The Secretary of the DoS also holds concurrent charge as the Chairman of the Space Commission of India, the ISRO, and its downstream entities. Until 2013, the Secretary of the DoS was also concurrently Chairman of Antrix. Now Antrix and NSIL each have their own Chairman-Managing Director at its helm.

ii. Department of Space—National Security and Geopolitical Concerns

The organizational and decision-making structure of the DoS could best be described as a unified command structure.[51] Arguably, the unified command structure is an important mechanism for the Indian space program's ability to withstand the storm of sanctions levied as a result of India's second underground nuclear test in 1998.[52] It was not until the improvement in US-India relations, following President Clinton's visit to India in March 2000, that there was an easing of sanctions.[53] Pursuant to the 2004 US-India Next Steps in Strategic Partnership (NSSP), sanctions imposed on certain entities engaged in nuclear and civil space applications

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[50] *Space Commission,* INDIAN SPACE RES. ORG., https://www.isro.gov.in/about-isro/space-commission.

[51] *See generally,* Andrew Jones, *'Revolutionary Change' Expected From New Indian Space Policy,* SPACENEWS.COM (Nov. 11, 2020), https://spacenews.com/revolutionary-change-expected-from-new-indian-space-policy/.

[52] Kamran Khan & Kevin Sullivan, *Indian Blasts Bring World Condemnation,* WASH. POST, (May 13, 1998), https://www.washingtonpost.com/archive/politics/1998/05/13/indian-blasts-bring-world-condemnation/112e024f-0c41-491c-89c8-5d5f54236fa1/.

[53] *See* Cong. Rsch. Serv., *India and Pakistan: U.S. Economic Sanctions* (Feb. 3, 2003), https://www.everycrsreport.com/files/20030203_RS20995_5558ede782076ba7256d545673c56275ade4569c.pdf.

were removed.[54] Finally, with the strengthening of Indian export controls and the acceptance of end-use inspections, the denials of space activity licenses were reduced significantly. Additionally, the High Technology Cooperation Group[55] helped build better understanding between the public and private sector about the political and legal constraints in each country. India is now a member of three out of the four export control regimes.[56] In hindsight, it would be reasonable to say that the sanctions and denial of technology regimes accelerated Indian scientists to use whatever means necessary to develop a range of indigenous technologies for both the nuclear and space sectors.

iii. Department of Space—Space Activities, Space and Ground Segment Functions

Among other functions allocated to DoS, paragraph 2 of the Allocation of Business Rules mandates ground segment activities in "[a]ll matters related to Space Science, Space Technology and Space Applications [including] . . . all activities connected with the development and use of outer Space, including . . . commercial exploitation of Space. . . . "[57] This provides a legal basis for the DoS and ISRO to enter into contracts with vendors to procure such goods and services as may be required for undertaking ground segment activities and for providing space based services to customers on a commercial basis.

Similarly paragraph 4 of the Allocation of Business Rules allocates to the DoS business related to "[i]nternational relations in matters connected with Space, including … matters relating to Space in the United Nations speciali[zed] agencies and in relation

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[54] *Next Steps in Strategic Partnership,* GLOBALSECURITY.ORG, https://www.globalsecurity.org/military/world/india/nssp.htm (last visited Feb. 26, 2021).

[55] *See* Eric L. Hirschhorn, Under Secretary of Commerce, Remarks on the U.S.-India High Technology Cooperation Group (Nov. 20, 2014), https://www.bis.doc.gov/index.php/about-bis/148-about-bis/newsroom/speeches/speeches-2014/777-u-s-india-high-technology-cooperation-group.

[56] Rakesh Sood, *India and Non-Proliferation Export Control Regimes* 38 (Observer Res. Found., Occasional Paper, Apr. 2018), https://www.orfonline.org/wp-content/uploads/2018/04/ORF_OccasionalPaper_150_NonProliferation_FinalForUpload.pdf.

[57] Allocation of Business (355th Amendment) Rules, 1961, Gen. S. R. & O. 1405(E), 171, https://cabsec.gov.in/writereaddata/allocationbusinessrule/completeaobrules/english/1_Upload_2229.pdf.

with other countries."[58] This provides the legal basis for the DoS to undertake activities in outer space through ISRO, as well as to participate in multilateral efforts connected with United Nations entities such as the Committee on Peaceful Uses of Outer Space (COPUOS).

iv. IN-SPACe and Reforms

IN-SPACe is established under the DoS and is tasked with facilitating private sector participation in the commercial space sector, pursuant to the reforms. IN-SPACe is expected to have a Chairman and Board of Directors that will include representatives from academia and industry. Presently, no information is available about whether the Secretary of the DoS holds concurrent charge as Chairman, or about the composition of the Board of Directors.

Information available indicates that IN-SPACe will have separate technical, legal, safety, security, monitoring, private industry assessment directories and requirements including further coordination of such activities. On July 29, 2020, the DoS released details about IN-SPACe including indicators about its role and responsibilities, structure, process for permission, process for sharing facilities, announcement of new opportunities and a directorate for monitoring and promotion.[59]

It is reasonable to assume that the final authority on decisions regarding manner and extent of private involvement in space activities of both the ground and space segments will vest in the DoS.

IV. SPACE REFORMS LEGAL PERSPECTIVES: DEPARTMENT OF SPACE—INTERNATIONAL SPACE TREATIES, STATE PRACTICE AND PROFESSOR BIN CHENG

A. The Space Segment and Space Reforms, 2020

The Allocation of Business Rules, paragraph 4, allocates to DoS international relations in matters connected with space including matters relating to space in the United Nations specialized agencies and in relation with other countries.

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[58] *Id.*

[59] *IN-SPACe*, *supra* note 6.

Paragraph 4 issued pursuant to constitutional provisions under Article 53[60] provides the DoS legal capacity to exercise delegated power for the purpose of undertaking space sector activities. The conduct of space activities under paragraph 4 is intrinsically qualified and derived from provisions under Article 51,[61] which is listed under "Directive Principle of State Policy" in Part IV of the Constitution of India. Article 51 enjoins the State to "(a) promote international peace and security; (b) maintain just and honourable relations between nations; [and] (c) foster respect for international law and treaty obligations in the dealings of organised peoples with one another; and encourage settlement of international disputes by arbitration." This is the foundation of India's State practice.

Consequently, India conducts national activities in outer space as a responsible space power in a manner consistent with the principles of the international space treaties. India has ratified the four principal Treaties on outer space,[62] and is signatory to the 1979 Moon Agreement.[63]

As such, under the international space treaty regime, India, as a State Party (acting through the instrumentality of the DoS and ISRO) bears responsibility to assure that its national activities in outer space are carried out in accordance with international law and the international space treaties. Furthermore, India bears

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[60] "The Executive power of the Union shall be vested in the President and shall be exercised by him directly or through officers subordinate to him in accordance with this Constitution." INDIA CONST. art. 53, § 1.

[61] Article 51 mandates that the "State shall endeavour to … (a) promote international peace and security; (b) maintain just and honourable relations between nations; (c) foster respect for international law and treaty obligations in dealings of organised peoples with one another; and (d) encourage settlement of international disputes by arbitration." *Id.* at art. 51.

[62] 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]; Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, Nov. 3, 1967, 19 U.S.T. 7570, 672 U..N.T.S 119 [hereinafter Rescue Agreement]; Convention on International Liability for Damage Caused by Space Objects, Nov. 9, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention]; Convention on Registration of Objects Launched Into Outer Space, Nov. 15, 1976, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

[63] The 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] was signed by India on January 18, 1982.

"international responsibility"[64] and international liability[65] in respect of national activities in outer space and on behalf of its non-governmental entities, including private companies, which are required to be duly authorized and supervised.[66]

At the present time, the DoS, through ISRO, is the only entity which undertakes national activities in outer space. Fortuitously, no incident has occurred involving objects for which India is a launching State that would trigger India's treaty obligations to assume international responsibility and liability. Thus, India's State practice has never been put to the test. That does not, however, preclude the possibility of such an event occurring in the future, given the internationally accepted threat from space debris to the safety of space assets and for long-term sustainable use of outer space.

i. Space Reforms 2020

It is important to note that international liability arises where damage is caused by an object for which India is a launching State, irrespective of ownership.[67] That being said, India's recent reforms contemplate participation of the private sector in activities in outer space and will add a new dimension to India's national space program; not in the least because the inclusion of private sector activities means that the DoS will bear international responsibility both for space activities on behalf of its non-governmental entities (private companies) and for ensuring that space activities by private entities are enacted under due authorization issued by the DoS and its continuing supervision.

As noted, the DoS will also bear international liability on behalf of the private companies in the event that a privately owned space object or its component causes damage to another State Party or to its natural or juridical persons in outer space, in air or on the Earth. This responsibility and liability for private space actors is in addition to national space activities conducted on behalf of the Indian government.

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[64] Outer Space Treaty, *supra* note 62, art. VI.
[65] *Id.* at art. VII.
[66] *Id.* at art. VI.
[67] *Id.* at art. VII. *See also* Liability Convention, *supra* note 62, arts. I-III.

Borrowing from the analysis of Professor Bin Cheng[68] will facilitate a clear understanding of whether India's State practice is sufficient to enable the DoS in fulfilling and implementing its substantive international treaty obligations or whether specific laws would be required to support private sector activities in outer space.

As a State Party, India bears "direct State responsibility" for breaches occurring in the course of conducting national space activities; activities for which it is internationally responsible and liable.[69] "Direct State responsibility" refers to a State's "responsibility for governmental acts, *i.e.*, acts or omissions of any of its servants or agents acting in their capacity as government officials."[70]

Furthermore, as a State Party, India also bears "indirect State responsibility" for a breach occurring due to actions of a non-governmental organization or private company.[71] "Indirect State responsibility" is described as an international obligation to protect foreign States and their nationals, as well as their property within the State's jurisdiction, particularly territorial jurisdiction, from injurious acts committed by persons who are not acting on its behalf.[72] Indirect State responsibility, although not absolute, refers to the duty of the State to use due diligence in accordance with prevailing international standards to prevent such injurious acts. The failure to do so by any branch of the State (legislative, executive or judicial), would involve direct State responsibility on account of failure attributed to its officials acting on behalf of the State. As such, it is clear that India's international obligations under the Outer Space Treaty extend to acts and omissions by its non-government entities that may be injurious to other States or their nationals, including property in outer space and within its territorial jurisdiction.

Professor Bin Cheng divides State jurisdiction in international law into "jurisfaction" (being the normative power of a State in international law to enact laws, make judicial pronouncements and adopt other decisions with legally binding effect) and "jurisaction" (being a State's power in international law to set up machinery to

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[68] *See* Bin Cheng, *International Responsibility and Liability for Launch Activities*, 20 AIR & SPACE L. 297 (1995).

[69] *Id.* at 308-09.

[70] *Id.* at 308.

[71] *Id.*

[72] *Id.*

make, implement and enforce, and physically to make, implement and enforce its laws, judicial pronouncements and other legally binding decisions).[73]

Therefore, in the context of India's international responsibility and international liability treaty obligations, a detailed and spherical analysis of India's State practice is merited to determine whether it is legally competent to support private sector activities in outer space.

ii. State Practice—Limitations on the scope and extent of Article 53, including Article 51

The scope and extent to which the executive power can be delegated under Article 53[74] has been brought for consideration of the courts, from time to time, variously in different facts and circumstances and applicable laws, including in respect of Article 51.

The Supreme Court conclusively settled the scope and extent of the general applicability of Article 51[75] under provisions of Article 53 in two landmark judgments: *Verghese v. Bank of Cochin*[76] and *Civil Rights Vigilance Committee vs. Union of India.*[77] At the outset, the Court took notice that provisions in Article 37 postulate that the directive principles of State policy, including Article 51, are not enforceable in any court of law.[78] However, the Court stated that the principles are, nevertheless, fundamental to the governance of the country and that the State has the duty to apply these principles in making laws.[79]

Specifically, in context of Article 51, the Supreme Court laid down that international treaties or agreements entered into by India do not have force of municipal law, without appropriate legislation.[80] However, because Article 51 contains fundamental principles that must inform India's approach to international law and

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[73] Bin Cheng, *The Extra-Territorial Application of International Law*, 18 CURRENT LEGAL PROBS. 132, 136 (1965).

[74] INDIA CONST. art. 53, §1.

[75] *Id.* at art. 51.

[76] Verghese v. Bank of Cochin, (1980) 2 SCR 913 (India) [hereinafter Verghese Case].

[77] Civil Rights Vigilance v. Union of India, AIR 1983 Kant 85, ¶ 10 (India) [hereinafter Civil Right Vigilance Case].

[78] *Id.*

[79] *Id.*

[80] *Id.* ¶ 18, *citing* Verghese Case, *supra* note 76.

treaty obligations, the Court called upon municipal courts, in the absence of contrary legislation, to respect rules of international law.[81]

Additionally, the Supreme Court directed that courts in India are bound to give effect to the domestic law, if there is an express legislation contrary to a rule of international law, *albeit*, in so doing, courts are directed to interpret law in such a way, if possible, as will not violate any established principle of international law.[82]

iii. Exceptions to the general applicability of Article 53

The Supreme Court has adjudicated matters in specific context to substantive question as to the extent to which executive authority can be delegated under Article 53, *albeit,* in different facts, circumstances and applicable laws. In so doing, the Supreme Court has determined that there are four exceptional circumstances, or exceptions, which are beyond the scope of applicability of Article 53 and require specific national laws to enable the State to fulfil its obligations.

> ***Exception 1*:** If an international treaty provides for payment to a foreign power, which must be withdrawn from the Consolidated Fund of India.[83]
>
> ***Exception 2*:** If an international treaty affects the justiciable rights of a citizen.[84]
>
> ***Exception 3*:** If an international treaty requires the taking of private property [Art.31(1)], taking of life or liberty [Art.21], such as extradition or imposition of a tax [Art.265], which under the Constitution can be done only by legislation.[85]
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> ***Exception 4*:** If an international treaty modifies the laws of the State.[86]

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[81] *See* Verghese Case, *supra* note 76.

[82] *Id.*

[83] Moti Lal & Ors. v. State of Uttar Pradesh, Unreported Judgments 1951, 111 ¶ 408.

[84] Maganbhai Ishwarbhai Patel v. Union of India, (1969) 3 SCR 254 (India); In Re Beubari Union, (1960) 3 SCR 250 (India).

[85] Mirza Ali Akbar Kashani v.United Arab Republic, (1966) 1 SCR 319, ¶ 30 (India).

[86] State of West Bengal v. Jugal Kishore More, (1969) 3 SCR 320, ¶ 6 (India).

A brief review of the four exceptions to Article 53 indicates that the legal capacity of DoS/ISRO, is severely curtailed, under the State Practice derived from Article 51 compliances. Most importantly, India's State practice does not provide DoS necessary legal capacity to assume and fulfill its "international responsibility" and "international liability" triggered by a breach in the course of undertaking activities in outer space, either on its own behalf or on behalf of its non-government entities (most notably, India's private companies). Two examples will suffice to illustrate the limitations of the State Practice.

Exception 1 (if payment to a foreign power, which must be withdrawn from the Consolidated Fund of India) has a direct bearing on the international responsibility and international liability linked to direct State responsibility and indirect State responsibility. If India is required to pay compensation in liquidated damages, for a breach in outer space, to foreign claimant(s) that is required to be drawn from the public exchequer (Consolidated Fund of India), it can be done only if India (DoS) is duly empowered under a specific legislation for that purpose. This would be the case, irrespective of whether the quantum of damage is mutually agreed to as between the parties, through any means or mechanisms employed for dispute resolution.

Exception 2 (If an international treaty affects the justiciable rights of a citizen) has direct bearing on direct State responsibility under Article V Outer Space Treaty and the 1968 Rescue Agreement.[87] This should be considered by DoS especially since it is actively working to realize India's first crewed space mission, "*Ganagyaa,"* in 2022.[88]

The position in law is, thus, quite clear. India's State practice does not provide the legal capacity to DoS to assume either direct State responsibility or indirect State responsibility for the purpose of implementing and fulfilling the international responsibility and

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[87] Rescue Agreement, *supra* note 62.

[88] Sangeeta Ojha, *4 Astronauts for India's First Manned Mission to Space 'Gaganyaan' Identified: ISRO*, LIVEMINT (Jan. 1, 2020), https://www.livemint.com/news/india/4-astronauts-for-india-s-first-manned-mission-to-space-gaganyaan-identified-isro-11577873182776.htmlhttps://www.livemint.com/news/india/4-astronauts-for-india-s-first-manned-mission-to-space-gaganyaan-identified-isro-11577873182776.html https://www.ndtv.com/india-news/gaganyaan-what-does-it-take-to-become-indias-gaganaut-nasa-astronaut-general-charles-boldens-pro-tip-2005652.

international liability treaty obligations, without enacting a law to give effect to the international space treaties ratified by India. The solution is provided in Constitution Article 253 concerning legislation for giving effect to international agreements.[89] The Constitution of India provides the framework to enable the State to exercise jurisdiction in international law in both dimensions—*jurisfaction* and *jurisaction*. It makes for a compelling case for Parliament to enact an Indian space activities law that harmonizes the broad principles contained in the Outer Space Treaty and empowers DoS with rule making powers in this regard.

Equally, in the converse perspective, there is a need to provide appropriate provisions in the space activities law which grant actionable rights and procedural mechanisms to the citizens (private companies) to prosecute claims and seek compensation for damage caused in outer space, in the air and on the Earth to Indian private space assets by a space object launched by another State and its non-government entity. Ideally, the space activities law should include provisions that grant liberty to private entities to settle disputes and prosecute claims for damages through lawful mechanisms, including but not limited to arbitration under the Permanent Court of Arbitration Optional Rules for Arbitration of Disputes Relating to Outer Space.[90] Such a provision would be consistent with State Practice principle under Article 51(c) constitutional provisions.

iv. Exceptions to Article 53 not in conflict with State Practice under Article 51.

The Supreme Court has laid down a caveat to the scope of the four exceptions to Article 53. The Court has directed that international treaties may be implemented in exercise of delegation power under Article 53, without requiring legislation or constitutional amendment in matters falling outside the four exceptions to Article

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[89] "Legislation for giving effect to international agreements - Notwithstanding anything in the foregoing provisions of this Chapter, parliament has power to make any law for the whole or any part of the territory of India for implementing any treaty, agreement or convention with any other country or countries or any decision made at any international conference, association or other body." INDIA CONST. art. 253.

[90] OPTIONAL RULES FOR ARBITRATION OF DISPUTES RELATING TO OUTER SPACE ACTIVITIES, PERMANENT CT. OF ARB. (2011).

51.[91] As such, it is clear that India's State practice shall not be in derogation of or in conflict with any other law in force, including a new Indian space activities law.

v. Space Reforms Policy—Promise and Reality

Arguably, an early start is best recommended in the pursuit of *Atmanirbhar Bharat* or self-reliant India, by permitting private companies to establish private satellite communications systems to reduce dependence on leased capacity from foreign communication satellites as discussed earlier. DoS must also establish an Indian Register for Space Objects in compliance Outer Space Treaty Article VIII[92] and the 1976 Registration Convention.[93] Space objects launched from India will be required to be entered in the India Registry for Space Objects to allow DoS to exercise jurisdiction and control over the private space asset for the purpose of maintaining continuing oversight of space objects launched, for share registration data when needed (e.g. to ensure national security, prevent collisions, space debris clean-up initiatives, among other such reasons), and using the data to give effect to other treaties, including International Telecommunication Union Convention.[94]

vi. Drafting an Indian Space Activities Law

It is important for the DoS to remember that international treaties are applicable and enforceable as between ratifying States and not so as between States and non- government entities (private companies).[95] Consequently, provisions of the four principal international space treaties ratified by India, do not apply directly to the private space companies. The treaty obligations must be made applicable *indirectly*, as it were, by legislating a national space activities law which harmonizes space treaty obligations and provides

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[91] *See* Verghese Case, *supra* note 76; Civil Rights Vigilance case, *supra* note 77.

[92] Outer Space Treaty, *supra* note 62, art. VIII.

[93] Registration Convention, *supra* note 62.

[94] Convention of the Int'l Telecomm. Union [ITU], *available at* https://www.itu.int/council/pd/convention.html. *See* Ranjana Kaul & Ram S. Jakhu, *Regulation of Space Activities in India*, *in* RAM S. JAKHU, NATIONAL REGULATION OF SPACE ACTIVITIES 153, 173 (2010).

[95] "Every treaty in force is binding upon the parties to it and must be performed by them in good faith." Vienna Convention on the Law of Treaties, May 23, 1969, 1155 U.N.T.S. 331.

appropriate rights, obligations and actionable rights to private entities. It is of utmost importance for India to examine each international space treaty to identify which obligations will fall under the four Exceptions under Article 53 and also which existing statutes will need to be appropriately amended. Only a balanced and clearly drafted statute, that does not impose unrealistic onerous obligations or prohibitions, will best serve national interest. Above all, the process of drafting the bill must be put through the normal rigorous open consultation process with stakeholders, interested persons; providing adequate time and opportunity to file written submissions and holding in person interactions, before committing the draft to the formal legislative process. A good starting step would be for DoS to circulate widely a White Paper on proposed terms and conditions in proposed law and the proposed space reforms policy.

B. National Activities in Ground Segment

i. Department of Space—Ground Segment, Reforms and Legal Capacity

The Allocation of Business Rules 1972,[96] paragraph 2 deals with all matters related to Space Science, Space Technology and Space Applications. It allocates under sub-para (i) "activities for the development and use of space, including with utilization of space including commercial exploitation of space."[97] Thus, paragraph 2 provides legal basis for DoS/ISRO to establish an ecosystem based on procurement contracts, for goods and services required for the space missions, with government and private sector companies. Over the last five decades, DoS/ISRO has established a dedicated ground segment vendor ecosystem.

Paragraph 2 also provides DoS legal capacity to commercially provide space-based services, including transponder capacity to commercial satellite telecom and broadcasting companies, EO data and commercial space launches. This activity is undertaken by Antrix and NSIL, the two commercial entities and the NRSC which is the aggregator and distributor of all EO data.

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[96] Allocation of Business (95th Amendment) Rules, 1961, Gen. S. R. & O. 498(E).

[97] *Id.*

ii. Supply Based Procurement Model and Applicable Law

It is estimated that the DoS/ISRO dedicated vendor network consists of about 150 companies which make up the core supply base, which is supported by an extended value chain of local suppliers consisting of about 400-500 companies. This network arrangement defines the extent to which the private sector participates in the space sector. It is also clear that the DoS/ISRO supply chain model is not intended to be scalable.

That said, it is known that DoS/ISRO has an established mechanism for engaging pro-actively and closely with private sector suppliers, including manufacturers and fabricators, to guide the companies through the execution phases. Consequently, private sector suppliers have developed excellent capability to manufacture and fabricate goods which meet ISRO design and specification standards and successfully deployed for the space program.

An integral aspect of the contracts is the absence of a design service element and it is estimated that not more than 10% of suppliers have in-house design capability. Perhaps the institutional approach of not sharing IPR related information may well be one of the reasons. As such, most companies do not own the intellectual property for which they provide manufacturing or service support. However, although the vendors are not permitted to export products, they are permitted to be partners for outsourced manufacturing. Several may be engaged supporting some NewSpace companies.

Two thousand eight was a cathartic moment for DoD/ISRO ground segment procurements. For the first time, ISRO took the initiative to expand the scope of engagement with the private sector. On July 18, 2018, the U. R. Rao Satellite Centre[98] (URSC) signed three separate, three-year contracts for undertaking assembly, integration and testing of nine small and medium satellites each. It may be noted that the contracts are regulated under applicable normative laws subject to such special and general conditions contract under government regulations and for the space sector, as described above.

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[98] U.R. RAO SATELLITE CENTRE, www.ursc.gov.in (last visited Oct. 3, 2020).

A total of 27 satellites are to be delivered by July 2021.[99] The awardees include two private sector entities: Alpha Design Technologies Pvt. Ltd with six consortium partners;[100] and Tata Advanced Systems Ltd.;[101] the third is Bharat Electronics Ltd,[102] a public sector defense company. The contracts include an information-sharing component and the execution of the projects requires the contractors to work with engineers at the three dedicated workstation facilities set up in URSC. It will put to test the ability of contracting parties to work seamlessly and harmoniously with each other. It is, therefore, a fair assumption that the outcomes of this first experiment will impact the trajectory of space reforms in the country.

Thereafter, in 2019, NSIL invited Expression of Interests from industry consortiums for production of the PSLV launch vehicle.[103] However, no further developments in this regard have been notified.

iii. Ground Segment, Applicable Law and Draft Space Activities Bill 2017

The vendor supply contracts are based on the Indian Contract Act,[104] albeit also subject to other applicable normative laws. Additionally, because these are government procurement contracts, the agreements are subject to the special and general conditions applicable to public procurement contracts, and other sector specific conditions, which may be prescribed by the federal government.

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[99] Special Correspondent, *ISRO Ropes in Three Partners to Assemble 27 Satellites*, THE HINDU (updated July 19, 2018), https://www.thehindu.com/news/national/isro-ropes-in-three-partners/article24454488.ece.

[100] *See* ALPHA DESIGN TECHS. PVT. LTD., www.adtl.co.in/(last visited Oct. 3, 2020); NEW TECH SOLS. PVT. LTD., http://www.ntsblr.com/ (last visited Oct. 3, 2020); AIDIN TECHS. PVT. LTD., www.aidintech.com/ (last visited Oct. 3, 2020); ANIARA COMM. PVT. LTD., www.aniara.co.in/ (last visited Oct. 3, 2020); VINYAS INNOVATIVE TECHS. PVT. LTD., http://www.vinyasit.com/ (last visited Oct. 3, 2020); DCX CABLE ASSEMBLIES PVT. LTD., www.dcxindia.com/ (last visited Oct. 3, 2020); EXSEED SPACE INDIA PVT. LTD., www.exseed.com/ (last visited Oct. 3, 2020).

[101] TATA ADVANCED SYS. LTD., www.tataadvancedsystems.com/ (last visited Oct. 3, 2020).

[102] BHARAT ELECTRONICS LTD., bel-india.in/ (last visited Oct. 3, 2020).

[103] *Tenders,* NEWSPACE INDIA LTD, https://www.nsilindia.co.in/tenders (last visited Feb. 28, 2021).

[104] The Indian Contract Act, 1872, No. 9, Acts of Parliament, 1872.

As such, it is clear that a private company, irrespective of whether it is an existing DoS/ISRO vendor or a new entrant proposing to undertake ground segment activities, whether as a government subcontractor or not, will be, without exception, similarly placed under the law. Therefore, no reason exists for a new law or inclusion of provisions in a new law, which specifically seeks to regulate new private entrants. A new classification for new entrants, without providing the rationale and intelligible differentia[105] which makes it capable of distinguishing new private entrants from the existing network of 600-700 private DoS/ISRO sub-contractors, will be bad in law and liable to legal challenge.

The afore-stated observation is particularly relevant in context to the Draft Space Activities Bill 2017 that was widely circulated and is said to be under review.[106] Indeed, if anything, several draconian provisions contained in the draft bill will expeditiously discourage many eager NewSpace companies. Unfortunately, the draft in its present form, manages to convey a degree of resistance to every aspect of private sector entry in the Space sector.

V. CONCLUDING REMARKS

In the end, the space reforms initiative wants to leverage India's advanced space capabilities to unlock the potential of space by deploying private sector participation, in keeping with the long-term vision of transforming India into a self-reliant country. Clearly, this must be a national effort and requires the all-hands-on-deck approach and effort. It is true that India's NewSpace will be the early beneficiaries, but it is not enough. The space reforms must also address the untapped and unrealized technological, innovative and entrepreneurial capacity of young India.

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[105] "The State shall not deny to any person equality before the law or equal protection of the laws within the territory of India." INDIA CONST. art. 14.

[106] Draft Space Activities Bill, *supra* note 12.

SPACE TRAFFIC MANAGEMENT – THE BIN CHENG MODEL

By Paul B. Larsen[*]

ABSTRACT

This paper[1] [2] reviews the mix of laws, government policies, elements, stakeholders and situations involved in space traffic management (STM). It describes the increasing traffic congestion of satellites and space debris. Part One describes current space traffic issues. Part Two discusses international law governing non-sovereign outer space.[3] Part Three reviews three options for STM: (1) the US system of national traffic control, including Space Policy

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[1] Bin Cheng was among the space law founders which include Alex Meyer (Germany), John Cobb Cooper (US), Myers McDougal (US), Wilfred Jenks (UK), and Andrew Haley (US). The author had occasion to meet them in the 1960s.

[2] This article was preceded by four earlier published STM research papers by the author:

(1) Paul B. Larsen, *Minimum International Norms for Managing Space Traffic, Space Debris, and Near Earth Object Impacts*, 83 J. AIR L. & COM. 739 (2018) [hereinafter *Minimum International Norms*];
(2) Paul B. Larsen, *Space Traffic Management Standards*, 83 J. AIR L. & COM. 359 (2018) [hereinafter *Space Traffic Management Standards*];
(3) Paul B. Larsen, *Solving the Space Debris Crisis,* 83 J. AIR L. & COM. 475 (2018) [hereinafter *Solving the Space Debris Crisis*];
(4) Paul B. Larsen, *International Regulation of Near Earth Objects (NEOs)*, 67 GER. J. AIR & SPACE L. 104 (2018) [hereinafter *International Regulation of NEOs*].

The article also addresses the U.S. Space Policy Directive-3. *See* National Space Traffic Management Policy, 83 Fed. Reg. 28,969 (June 18, 2018) [hereinafter Space Policy Directive-3].

[3] *See* Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art. 2, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty].

Directive-3[4] and its international coordination problems; (2) the 2018 International Academy of Astronautics STM model,[5] which draws on the legal framework of the International Telecommunication Union;[6] and (3) the International Civil Aviation Organization[7] (ICAO) model, favored by Bin Cheng. All these options are evaluated, and the paper ultimately recommends that an ICAO-style model for international STM presents the most workable, comprehensive option for ensuring the safe tracking, operation and traffic management of space objects in the future.

I. SPACE TRAFFIC PROBLEM: HOW TO AVOID COLLISIONS

Risk of collision is the most urgent risk in outer space. The purpose of space traffic management (STM) is to avoid collisions of space objects during their launch, operation in outer space and deorbit.[8] Traffic collisions and near misses in outer space deeply concern all satellite operators. The need for STM is being discussed not only by those involved in actual satellite operations but also among governments and by an STM working group in the United Nations (UN) Committee on the Peaceful Uses of Outer Space (COPUOS).[9] It is a make-or-break issue which must be resolved in order for the exploration and use of outer space by humankind to progress. This

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[4] *See* Space Policy Directive-3, *supra* note 2.

[5] Kai-Uwe Schrogl, Chairman, Int'l Acad. of Astronautics, Research Presentation at the University of Oslo, 2018 IAA Study on Space Traffic Mgmt. (Feb. 5, 2020), https://www.jus.uio.no/english/research/areas/intrel/events/2020/050220-stm--space-traffic-managementuni-oslo.pdf. The IAA is an independent nongovernmental organization dedicated to the advancement of aerospace activities.

[6] *See* INT'L TELECOMM. UNION [ITU], CONSTITUTION OF THE INTERNATIONAL TELECOMMUNICATION UNION, https://www.itu.int/en/council/Documents/basic-texts/Constitution-E.pdf [hereinafter ITU CONSTITUTION].

[7] *See* Convention on International Civil Aviation arts. 43-66, Dec. 7, 1944, 1944 U.S.T. LEXIS 146, 15 U.N.T.S. 295 (Dec. 7, 1944) [hereinafter Chicago Convention].

[8] INT'L ACAD. OF ASTRONAUTICS, SPACE TRAFFIC MANAGEMENT TOWARDS A ROADMAP FOR IMPLEMENTATION 22 (Kai-Uwe Schrogl, et al. eds., 2018) [hereinafter IAA STM ROADMAP] (defining space traffic management as "the set of technical and regulatory provisions for promoting safe access into outer space, operations in outer space and return from outer space to Earth free from physical or radio-frequency interference."). *See also* Stephen Garber & Marissa Herron, *How Has Traffic Been Managed in the Sky, on Waterways, and on the Road? Comparisons for Space Situational Awareness (Part 1)*, SPACE REV. (June 8, 2020), https://www.thespacereview.com/article/3961/1.

[9] Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Sixty-Second Session, U.N. Doc. A74/20, at 31 (June 12-21, 2019) [hereinafter COPUOS Sixty-Second Session].

paper will primarily have a United States (US) focus, but will make comparisons to other nations' systems of STM.

Bin Cheng describes the international air traffic management policies of the International Civil Aviation Organization (ICAO) in *The Law of International Air Transport*.[10] Imagine flying into Heathrow, JFK or the Frankfurt airport without the aid of air traffic control. No experienced pilot would be willing to try—the danger of collision with other aircraft would be too great. Mandatory flight safety requires aircraft to be regulated by air traffic control management as well as by international flight standards and recommended practices adopted by ICAO.[11] Cheng expressed as early as the 1960s that, in the future, STM would require an international regulatory framework similar to that established for aviation. As Cheng wrote:

> Once it is decided to draw up a general agreement to regulate the peaceful exploration and exploitation of outer space, the contracting States may do well to agree also on the setting up of an international organization similar to the ICAO established under the Chicago Convention, 1944.[12]

A. Current Space Traffic Collision Management

A number of diverging government policies, elements, stakeholders and developments are involved in STM.

i. Increasing Traffic Congestion in Outer Space

Commercial satellite operators in the US currently plan to launch 58,000 small satellites in large constellations over the next decade.[13] Space-X alone has applied to the Federal Communications Commission (FCC) for authority to launch 48,000 small satellites in several mega-constellations.[14] To date, it has already

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[10] *See* BIN CHENG, THE LAW OF INTERNATIONAL AIR TRANSPORT (George W. Keeton & Georg Schwarzenberger eds., 1962).

[11] Chicago Convention, *supra* note 7, art. 37.

[12] BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 49 (1997).

[13] Irene Klotz, *Burgeoning LEO*, AVIATION WEEK & SPACE TECH., Mar. 9-22, 2020, at 54.

[14] Caleb Henry, *SpaceX Submits Paperwork for 30,000 More Starlink Satellites*, SPACENEWS (Oct. 15, 2019), https://spacenews.com/spacex-submits-paperwork-for-30000-more-starlink-satellites/. *See also* Klotz, *supra* note 13.

successfully launched over 650.[15] While all these plans may not be fully carried out because of delays caused by the COVID-19 pandemic, experts expect at least 20,000 satellites will be launched by the year 2030—a dramatic increase in the current number of satellites (approximately 2,000) operating in orbit.[16] If these predictions come to pass, civilian space traffic will increase ten-fold over the next decade.

The growing volume of satellites makes STM increasingly urgent. Collisions of spacecraft in outer space have already occurred.[17] Due to lack of maneuverability or propulsion systems, many of the active satellites cannot be navigated to avoid collisions with known traffic hazards. The overarching issue in contention is whether the individual operators and individual States have rights to assume control of outer space. The 1967 Outer Space Treaty established the legal principle of non-sovereignty in outer space, fundamentally regulating this issue when space technology was in early development.[18] Thus, individual operators must follow international traffic protocols. Nevertheless, since the Treaty came into force, regulation has been primarily seen as a responsibility of individual States.[19]

ii. Collision Threats of Space Debris[20]

Space debris in outer space is a greater traffic hazard than active satellite traffic, which must protect against collisions with space debris. Space debris is primarily a product of past activities in outer space, which includes both State and commercial operators'

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[15] Stephen Clark, *SpaceX Adds More Satellites to Ever-Growing Starlink Network*, SPACEFLIGHT NOW (Aug. 18, 2020), https://spaceflightnow.com/2020/08/18/spacex-adds-more-satellites-to-ever-growing-starlink-network/.

[16] Klotz, *supra* note 13. *See also* Garber & Herron, *supra* note 8.

[17] For example, in 2009, a defunct Russian satellite (Cosmos 2251) collided in outer space with a second operational satellite (Iridium 33) destroying the two satellites. *See infra* Section I.A.2.

[18] Outer Space Treaty, *supra* note 3, art. II.

[19] FRANCIS LYALL & PAUL B. LARSEN, SPACE LAW: A TREATISE 270-75 (2d ed. 2018). *See also Debris Remediation*, ASTROMATERIALS RESEARCH & EXPL. SCI. ORBITAL DEBRIS PROGRAM OFF., https://orbitaldebris.jsc.nasa.gov/remediation/ (last visited June 13, 2020).

[20] For more detailed information on this topic, *see* LYALL & LARSEN, *supra* note 19, 270-75.

failure to remove defunct satellites.[21] Some, however, is caused deliberately. For example, China's intentional destruction of one of its own low-Earth orbit (LEO) weather satellites with an anti-satellite weapon to prove the effectiveness of its weaponry in 2007,[22] and the US's intentional destruction of a malfunctioning satellite in 2008.[23] The volume of debris is rapidly increasing. The 2009 collision of a Cosmos 2251 satellite with an Iridium 33 satellite caused thousands of additional debris pieces.[24] The International Space Station often has to change orbit to avoid collisions with space debris.[25]

Among the most serious consequences of an increased amount of space debris in LEO is the foreclosure of access to space.[26] In 1978, National Aeronautics and Space Administration (NASA) scientist Donald J. Kessler theorized that debris fragments endlessly multiply as they collide with other debris.[27] An implication of Kessler's theory, known as the "Kessler Syndrome," is that unless the generation of space debris is halted and existing debris is reduced and controlled, the amount of debris will eventually form a belt of debris around the Earth.[28] Debris remains in orbit for many years, and debris as small as one centimeter can disable a space object.[29] There are now several million debris pieces in orbit, one million of which are presently creating traffic risks for operating spacecraft. Certain orbits must be avoided because of collision dangers. Space debris also interferes with use of radio frequencies, which further contributes to the increasing scarcity of this resource. In short, space debris is both dangerous and costly.[30]

In 2007, COPUOS adopted its Space Debris Mitigation Guidelines, which were endorsed by the UN General Assembly.[31] The

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[21] ORG. FOR ECON. COOPERATION & DEV., SPACE SUSTAINABILITY: THE ECONOMICS OF SPACE DEBRIS IN PERSPECTIVE 19 (Apr. 2020) [hereinafter SPACE SUSTAINABILITY].

[22] *Id.*

[23] LYALL & LARSEN, *supra* note 19, at 271 n.147.

[24] *Space Debris and Human Spacecraft*, NASA, https://www.nasa.gov/mission_pages/station/news/orbital_debris.html (last visited May 29, 2020).

[25] *Id.*

[26] LYALL & LARSEN, *supra* note 19, at 271.

[27] *See* Donald. J. Kessler & Burton G. Cours-Palais, *Collision Frequency of Artificial Satellites*, 83 J. GEOPHYSICAL RES. 2637 (1978).

[28] *See id.*

[29] NASA, *supra* note 24.

[30] *See* SPACE SUSTAINABILITY, *supra* note 21, at 16-19.

[31] The 2007 guidelines, endorsed by U.N. General Assembly, are the following:

1. Limit the amount of debris released during normal operations

Guidelines reflect the space traffic and technology that existed at the time they were adopted.[32] While the Guidelines constituted the first step towards the establishment of over-all international coordination to mitigate the collision hazards in outer space, they were intended to be updated as technology and outer space conditions continued to change and develop.[33] Such an update, however, has not yet happened.[34] Further, the Guidelines are voluntary.[35] They are made mandatory by several governments, but the mitigation is insufficient.[36] The competing interests of all the parties involved have not yet yielded a mandatory international legal regime for debris.[37]

The overwhelming amount of debris in orbit has motivated planning to remove the largest and most dangerous debris from outer space. That requires development of new technology. It also presents legal problems. Article 1 of the Convention on International Liability for Damage Caused by Space Objects (Liability Convention) defines space objects to include "component parts of a space object as well as its launch vehicle and parts thereof."[38] Launching States may not agree that their space objects are defunct

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> 2. Minimize the potential for break-ups and cause minimum space debris when break-ups happen.
> 3. Limit the probability of accidental break-up in outer space;
> 4. Avoid intentional destruction of space objects and other harmful activities;
> 5. Minimize the potential for post-mission break-up resulting from stored energy by designing spacecraft so as not to break up and spread debris pieces including fuel;
> 6. Limit the long term presence of space craft and launch vehicle orbital stages in the LEO region after the end of their mission to 25 years; and
> 7. Limit the long-term interference of spacecraft and launch vehicle in the geosynchronous Earth region at the end of their mission.

COPUOS Sixty-Second Session, *supra* note 9, at 47-50. *See also* G.A. Res. 62/217, ¶ 26 (Feb. 1, 2008) (endorsement of guidelines by U.N. General Assembly).

[32] *See generally* Comm. on The Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on its Sixty-Second Session, UN. Doc. A/A62/20 (2007).

[33] *Id.* at 128.

[34] *Id.* at Annex 1, 5.

[35] *Id.* at 119.

[36] *Id.* at 48.

[37] SPACE SUSTAINABILITY, *supra* note 21, at 7-9. *See also* Paul B. Larsen, *Outer Space: How Shall the World's Governments Establish Order Among Competing Interests*, 29 WASH. L. REV. 1, 59-60 (2019).

[38] Convention on International Liability for Damage Caused by Space Objects art. 1, Mar. 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187 [hereinafter Liability Convention].

and should be removed. They may insist on continued ownership of their debris. Debris removal by other than the launching State may require the agreement of the registered State.[39] Furthermore, the launching State may insist that the removing agency assume all liability incurred in the removal.

The US Space Policy Directive-3 recognizes proliferation of space debris as the major reason STM is needed: "Orbital debris presents a growing threat to space operations. Debris mitigation guidelines, standards, and policies should be revised periodically, enforced domestically, and adopted internationally[.]"[40] Toward that goal, it is necessary to

> [d]evelop STM standards and best practices. As the leader in space, the United States supports the development of operational standards and best practices to promote safe and responsible behavior in space. A critical first step in carrying out that goal is to develop U.S.-led minimum safety standards and best practices to coordinate space traffic. U.S. regulatory agencies should, as appropriate, adopt these standards and best practices in domestic regulatory frameworks and use them to inform and help shape international consensus practices and standards.[41]

Space Policy Directive-3 assigns to the Department of Commerce (DOC) the lead responsibility for guidance that will reduce the probability of collisions.[42] So far, however, the US Congress has failed to appropriate the necessary funds.[43]

Space debris may be analogized to unmanned aircraft (drones), the traffic of which is regulated by the Federal Aviation Administration (FAA). An argument can be made that space debris could

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[39] *See id.*

[40] Space Policy Directive-3, *supra* note 2, at 28,970.

[41] *Id.* at 28,971 (emphasis omitted).

[42] *See id.*

[43] Christian Davenport, *Thousands More Satellites Could Soon Be Launched into Space. Can the Federal Government Keep Up?*, WASH. POST (July 23, 2020), https://www.washingtonpost.com/technology/2020/07/23/satellites-collisions-tracking-space/.

similarly be made subject to international debris standards, practices and procedures.[44]

iii. STM by Non-Governmental Satellite Operators

Non-governmental satellite operators tend to rely on the vastness of outer space to prevent collisions.[45] They have common interests with other independent operators in avoiding collisions and in being able to do business. They compete with each other for business and for interference-free radio frequencies.[46] Some have formed various trade associations. The large satellite operators—SES, Intelsat, Eutelsat and others—have organized themselves as the Space Data Association (SDA).[47] The SDA, in turn, created the Space Data Center, which shares traffic information among members.[48] The members share information about traffic hazards obtained from the US Department of Defense (DOD) Combined Space Operations Center (CSpOC).[49] The SDA has formed subcommittees on safety and radio frequency interference. It also represents the interests of the members before government regulatory bodies. Similarly, the Commercial Smallsat Spectrum Management Association represents small satellite operators like OneWeb, Planet, Kepler and Hawkeye 30.[50] The Consortium for Execution of Rendezvous and Servicing Operations (CONFERS) represents a group of satellite operators wishing to establish industry norms to service operating satellites.[51] All of the trade associations are affected by traffic collisions in outer space. Their various space traffic management objectives are affected by such factors as the competing interests of individual operators, individual trade associations, and large

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[44] Stephen Garber & Marissa Herron, *How Has Traffic Been Managed in the Sky, on Waterways, and on the Roads? Comparisons for Space Situational Awareness (Part 2)*, SPACE REV. (June 15, 2020), https://www.thespacereview.com/article/3964/1.

[45] *See* Larsen, supra note 37.

[46] *Minimum International Norms*, *supra* note 2, at 780-82.

[47] *See Participants*, SPACE DATA ASS'N, https://www.space-data.org/sda/participants/ (last visited Oct. 4, 2020). *See also Committees and Working Groups,* SPACE DATA ASS'N, https://www.space-data.org/sda/committees-and-working-groups/ (last Visited Oct. 4, 2020).

[48] *Minimum International Norms*, *supra* note 2, at 780-82.

[49] *See infra* notes 86-89 and accompanying text.

[50] *See Minimum International Norms*, *supra* note 2, at 780-82.

[51] *See id.*

companies versus small companies. Individual commercial operators are also beginning to market space traffic information.

iv. Military Impact on Space Traffic Management

Bin Cheng describes the advantages of civil aviation of being regulated by the international safety standards and recommended practices established by ICAO pursuant to the Chicago Convention.[52] ICAO does not include military aviation. Cheng recommends similar civil separation from military for space traffic.[53]

One safety problem for civilian space traffic is that the military operators view outer space as their operational domain. Outer space is considered to be a "warfighting domain."[54] The military reasoning is that outer space provides the proverbial high ground from which to dominate Earth militarily (a concept famously explained by the Chinese strategist Sun Tzu in his seminal work of strategy, *The Art of War*[55]). Some military operations are shrouded in secrecy. States use orbiting military reconnaissance satellites to gather information about foreign countries. Their presence is not disclosed to non-military space object operators. As a counterweight to secrecy the military operators are concerned about the safety of their satellites, however, the DOD CSpOC tracks both military and civilian traffic in order to avoid military collisions with civilian space objects.[56] For that reason, military operators tend to coordinate with, and operate by the same traffic rules as, civilian space object operators.[57] Although not required by the ITU to obtain cleared radio frequencies and related orbital slots through ITU,[58] the military authorities tend to clear their use of radio frequencies with the ITU anyway. Yet another military safety stake in outer space is the US military's operation of Global Navigation Satellite

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[52] *See* CHENG, *supra* note 12, at 44, 523-38.

[53] *See id.* at 47.

[54] *See* Establishment of the United States Space Force, 84 Fed. Reg. 6,049 (Feb. 25, 2019) [hereinafter Space Policy Directive-4]. *See also Trump: "Space is the world's newest war-fighting domain*", BBC NEWS (Dec. 21, 2019), https://www.bbc.com/news/av/world-us-canada-50875940.

[55] SUN TZU, THE ART OF WAR (Thomas Cleary trans., 2005)

[56] *See infra* notes 87-92 and accompanying text.

[57] *See Space Traffic Management Standards*, *supra* note 2, at 371.

[58] ITU CONSTITUTION, *supra* note 6.

Systems (GNSS), which benefits both civilian and military activities.[59]

The collision danger for military satellites is becoming increasingly important as military operations in LEO increase.[60] It is in the long-term interests of military operators to support space traffic management to help avoid potential collisions in the future.

v. US Governmental Oversight of Space Traffic

a. FAA Delegated Authority to Authorize Launches and Deorbits of Non-governmental Space Flight

Article VI of the Outer Space Treaty requires the activities of non-governmental operators be authorized and supervised in order to assure that national activities "are carried out in conformity with the provisions set forth in the present Treaty."[61] The US Commercial Space Launch Act consequently delegates to the Department of Transportation the task of authorizing and supervising launch and reentry of US non-governmental satellites, which the Department does through the FAA.[62] The FAA does not have statutory authority to regulate outer space activities.

Outer space safety is an important regulatory element. 51 U.S.C. § 50901 recognizes that "space transportation is inherently risky," which the FAA must take into consideration in granting launch licenses.[63] In order to issue a launch permit to the applicant, the FAA considers the public safety aspects of the launch including safety of the payload, environmental impacts and national security.[64] The FAA also weighs adequacy of the applicants' insurance to reimburse the US government for possible liability under the Liability Convention as well as covering other insurance

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[59] LYALL & LARSEN, *supra* note 19, at 357-58.

[60] *See* Sandra Erwin, *On National Security: The Promise and Perils of LEO Constellations*, SPACENEWS (July 4, 2020), https://spacenews.com/the-promise-and-perils-of-leo-constellations/.

[61] Outer Space Treaty, *supra* note 3, art. VI.

[62] 51 U.S.C. §§ 50901-23.

[63] 51 U.S.C. §§ 50901(a)(12).

[64] *See generally Environmental*, FED. AVIATION ADMIN., https://www.faa.gov/space/environmental/#erp (last visited Oct. 5, 2020) (explaining that FAA licensing is subject to the National Environmental Policy Act).

consequences.[65] FAA inspectors monitor the actual launches; they may revoke launch permits if the launch violates any of the terms of the launch permit, however the FAA may also issue less stringent experimental and research launch and reentry permits.[66]

Presidential Space Policy Directive-2 streamlines US regulation of the commercial use of space. The policy's regulatory emphasis is to: "promote economic growth; minimize uncertainty for taxpayers, investors, and private industry, protect national security, public safety, and foreign policy interests."[67] The Policy Directive places greater safety responsibility on the non-governmental operators.

b. Department of Commerce, NOAA Regulation of Earth Observation Traffic

In 1967, the Outer Space Treaty provided that space is free for use, subject to international law.[68] In 1986, the UN General Assembly Res. 41/65 affirmed that freedom. The UN Resolution defined remote sensing of Earth from outer space as sensing of the Earth for the purpose of "resource management, land use and the protection of the environment."[69] US law, 51 U.S.C. § 60134, requires government permission to engage in remote sensing. The National Oceanic and Atmospheric Administration (NOAA) weighs and approves applications and subsequently audits US remote sensing operators annually to establish their compliance with NOAA regulations. Thus, NOAA adds yet another aspect to consider in future traffic control in outer space. The Department of Commerce (DOC), Office of Space Commerce, also aims to provide space traffic information. The DOC is establishing its Open Architecture Data Repository to combine space traffic data. [70]

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[65] 51 U.S.C. § 50914.

[66] *Id.*

[67] Streamlining Regulations on Commercial Use of Space, 83 Fed. Reg. 24,901 (May 30, 2019) [hereinafter Space Policy Directive-2].

[68] Outer Space Treaty, *supra* note 3, arts. I and III. For more detailed information on this topic, *see* LYALL & LARSEN, *supra* note 19, at 359-86.

[69] G.A. Res. 41/65, Annex Principle 1(a) (Dec. 3, 1986).

[70] *See* Jeff Foust, *Commerce Department Hopes Study Will Free Up Funding for Space Traffic Management Work*, SPACENEWS (June19, 2020), https://spacenews.com/commerce-department-hopes-study-will-free-up-funding-for-space-traffic-management-work/. *See also* Marcia Smith, *NAPA Endorses Office of Space Commerce for Space Traffic Management Role*, SPACE POL'Y ONLINE (Aug. 20, 2020),

c. The FCC and the ITU[71]

Space objects are navigated from Earth by use of radiofrequencies. The ITU prevents satellites in outer space orbit from colliding with other satellites by requiring them to have cleared radiofrequencies, free of harmful interference that may distort navigation resulting in collisions. Only ITU can assure cleared channels enabling satellites to be navigated safely. Virtually all States are parties to the ITU Constitution.[72] The ITU constitution Article 45 requires frequencies to "be established and operated in such a manner as not to cause harmful interference."[73] Similarly its Article 44 states that radiofrequencies and their associated orbits, including the geostationary orbit, are limited natural resources that must be allocated and used "rationally, efficiently and economically"[74] taking the needs of developing and geographically disadvantaged countries into special consideration. The satellite operators do not own radiofrequencies assigned to them for use because *inter alia* Article II of the Outer Space Treaty provides that outer space is not subject to appropriation.[75] Thus, ITU could cancel a frequency assignment if an operator failed to comply with the ITU radio regulations.[76]

The FCC represents the US government in the ITU. Individual non-governmental operators do not have standing to deal directly with the ITU.[77] Individual non-governmental operators must apply for frequencies through the FCC. The FCC obtains cleared frequencies and associated orbits through the ITU, and the FCC in turn allocates frequencies in accordance with the FCC regulations established under federal law, 47 U.S.C. §§ 301 and 307, based on what is in the public interest.[78]

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https://spacepolicyonline.com/news/napa-endorses-office-of-space-commerce-for-space-traffic-management-role/.

[71] *See* LYALL & LARSEN, *supra* note 19, at 189-224. *See also* 47 U.S.C. § 151 (FCC statutory authority to license use of radio frequencies).

[72] *See* LYALL & LARSEN, *supra* note 19, at 189-224. *See also* ITU CONSTITUTION, *supra* note 6.

[73] ITU CONSTITUTION *supra* note 6, art. 45.

[74] *Id.* at art. 44.

[75] Outer Space Treaty, *supra* note 3, art. II.

[76] ITU CONSTITUTION, *supra* note 6.

[77] *See id.*

[78] 47 U.S.C. §§ 301, 307.

The competition for cleared frequencies is fierce. The FCC has the legal authority to restrict the issuance of FCC licenses to only qualified applicants. In the past the FCC has not been deeply involved in space traffic collision prevention, but in the absence of other US government regulation of space traffic, the FCC has lately begun to move into this problem area.[79] One FCC focus is on the biggest traffic problem which is space debris.[80] The FCC is also concerned with the collision dangers caused by constellations of thousands of satellites.[81] Consequently, in 2019 the FCC issued a proposed rulemaking requiring prospective licensees to describe their probability of colliding, their effectiveness in navigation, their ability to avoid close encounters with other traffic, and their ability to manage potential liability.[82] The FCC appears to understand the collision dangers and the need to improve safety.[83] It specifically proposes that all operators: (1) be able to maneuver their satellites to avoid collisions; (2) disclose collision risks; (3) disclose ability of satellites to be tracked, identified and comply with space situational awareness (SSA) requirements; (4) provide further information for GSO license extensions: (5) clarify their control of satellite communications; (6) reimburse liability obligation of the US under the Liability Agreement; (7) comply with certain FCC rules; and finally (8) possibly require applicants for frequencies post $5-100 million bonds to be payable in case the operators fail to deorbit and dispose of the satellite at the end of its useful life.[84] Whether the Commission is equipped to totally address space traffic management is questionable; but it has correctly identified collision hazards and remedies that must be considered when granting radiofrequency licenses to satellite operators.

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[79] *See* Ian Christensen et al., *The FCC Takes a Leadership Role in Combating Orbital Debris*, SPACE REV. (Apr. 20,2020), https://www.thespacereview.com/article/3926/1.

[80] *See* Orbital Debris in the New Space Age, Report and Order and Further Notice of Proposed Rulemaking, 84 Fed Reg. 4,742 (proposed Feb. 19, 2019) [hereinafter FCC Notice of Proposed Rulemaking].

[81] *See generally* FCC, *Mitigation of Orbital Debris in the New Space Age,* FCC FACT SHEET, (Apr. 2, 2020) https://docs.fcc.gov/public/attachments/DOC-363486A1.pdf.

[82] FCC Notice of Proposed Rulemaking, *supra* note 80, at 4,744.

[83] *See* Caleb Henry, *Understanding the FCC's Outsized Impact on the Space Industry*, SPACENEWS (May 20, 2020), https://spacenews.com/understanding-the-fccs-outsized-impact-on-the-space-industry/.

[84] *See* FCC Notice of Proposed Rulemaking, *supra* note 80, at 4,756-57.

vi. Liability for Collision Damages[85]

Outer space traffic is dangerous and collisions will happen. Liability is costly. Thus, liability for damages caused to and by other space objects in outer space traffic is an important issue. Is the launching State liable if its governmental or non-governmental satellite operators cause damage to space objects of other States in outer space? Customary international law as well as the treaty framework provided by the UN suggest just this.[86] The Trail Smelter Arbitration held Canada liable for allowing a non-governmental Canadian operator to cause damage in the US to property across the Canadian-US border.[87] That decision has become part of customary international law. Taking that ruling one step further, Article VII of the Outer Space Treaty establishes international liability of States that launch or procure launches of space objects into outer space.[88] Article III of the Liability Convention enlarges the scope of liability to include those States from whose territory or facility space objects are launched.[89] The Liability Convention clarifies liability for the component parts of space objects.[90] However, for damage caused in outer space, Article III limits liability to damages caused by the fault of a State "or the fault of persons for whom it is responsible."[91] Consequently, collisions and interferences in outer space would require proof of fault of the offending operator.[92]

The US and several other States interpret the Liability Convention to apply only to damages caused directly by the State, thus leaving indirect damages outside of the Convention.[93] That means these damages would be considered under other international law or State liability laws. Interestingly, Bin Cheng does not agree with

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[85] For more detailed information on this topic *see* LYALL & LARSEN, *supra* note 19, 95-110.

[86] *See generally* Liability Convention, *supra* note 38.

[87] Trail Smelter (U.S. v. Can,) 3 R.I.A.A. 1905 (1938, 1941). Similar decisions include Chorzow Factory (Ger. v. Pol.), Judgment, 1928 P.C.I.J (Ser. A) No. 13 and Military and Paramilitary Activities in and Against Nicaragua (Nicar. v. U.S.), Judgment, 1986 I.C.J. Rep. 14 (June 27).

[88] *See* Outer Space Treaty*, supra* note 3, art. VII.

[89] *See* Liability Convention, *supra* note 38, art. I.

[90] *See id.* at art. I.

[91] *See id.* at art III.

[92] *See id.* at art. III.

[93] *See* CHENG, *supra* note 12, at 237.

the US view of liability.[94] In his view the Trail Smelter opinion makes States liable for all activities in space, whether carried on by a governmental or a non-governmental agency.[95] Both are deemed to be subject to the governmental liability of the launching State.[96]

Importantly, collision with unidentified space debris leaves the operator of a satellite in the difficult situation of not knowing against whom to bring claim for liability. Avoidance of collisions with space debris is therefore a most urgent issue.

Only one case has arisen under international law on liability in outer space.[97] A Russian Cosmos 954 nuclear powered satellite crashed in Northern Canada in 1978 scattering nuclear debris over a large area.[98] Canada's claim was based on general international liability law and the Liability Convention. Russia denied liability, but Canada and Russia settled the claim for $6 million.[99] The active space traffic and the resulting traffic congestion in the future will result in more such claims. Most claims will be made by non-governmental operators. Their claims do not fit well under existing international treaty law requiring claims to be made by States. Perhaps a different claims procedure will be needed such as that which exists for international aviation and maritime claims.[100]

Potential Liability of the authorizing States should make the authorizing State careful to examine the safety of the space object to be launched.

vii. Insurance Consequences of Collisions

US law, 51 USC § 50914, requires non-governmental operators to obtain liability insurance to reimburse the US government for its liability exposure under the Liability Convention as well as to cover its own direct liability exposure to third parties.[101] Outer space satellite operations are hazardous and operators need to obtain insurance to cover the risks of launch and of collisions. Burgeoning traffic

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[94] *See* CHENG, *supra* note 12, at 237.

[95] *Id.*

[96] *Id.*

[97] LYALL & LARSEN, *supra* note 19, at 107.

[98] *Id.*

[99] *Id.*

[100] *See* Paul B. Larsen, *Does New Space Require New Liability Laws?*, 68 GER. J. AIR & SPACE L. 196, 196 (2019).

[101] 51 U.S.C. § 50914. Amount of insurance is based on a risk assessment by the FAA.

increases the likelihood of collisions with space debris. The operator carries the entire risk if the operator does not know against whom to bring claim for damages caused by unidentified objects.

Space insurers depend on obtaining reinsurance. Thus, during the early years of its technological development, the Chinese Government had to provide reinsurance when launching Western commercial satellites.[102] Established reinsurance companies were not able to provide reinsurance until these early Chinese operators developed a history from which analyzed risks could be assessed.[103] Once more comprehensive data was created, the established reinsurance companies were willing to engage in reinsurance with China.[104]

An indication of the increasing collision risk in heavily-congested LEO is that Assure Space, a major space insurance company, announced in early 2020 that it would no longer sell space insurance, because the risk of collision was too high to be commercially feasible.[105] The company's decision was based on the risk of collision with other satellites and the risk of collision with space debris.[106] This decision was made after several close encounters and near misses with space debris in LEO.[107] Examples of risky space traffic situations include a near-miss in January 2020, when a NASA space object came within a few meters of colliding with a US military space object, neither of which were navigable;[108] and another incident in 2019, when the European Space Agency (ESA) had to move a satellite to avoid a SpaceX satellite because the two objects were on a collision course.[109] Consequently, the space environment in LEO has become too hazardous for Assure Space.[110] Other insurance companies are likely to follow suit or increase insurance

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[102] YUN ZHAO, NATIONAL SPACE LAW IN CHINA: AN OVERVIEW OF THE CURRENT SITUATION AND OUTLOOK FOR THE FUTURE 70 (2015).

[103] *Id.* at 56-57.

[104] *Id.* at 75.

[105] Debra Werner, *Assure Space Won't Cover Collision Risk in Low Earth Orbit*, SPACENEWS (Mar. 11, 2020), https://spacenews.com/assure-space-leaves-leo/.

[106] *Id.*

[107] *Id.*

[108] William Graham, *Close Call as Two Satellites Avoid Collision*, NASASPACEFLIGHT.COM (Jan. 29, 2020), https://www.nasaspaceflight.com/2020/01/close-call-two-satellites-avoid-collision/.

[109] Werner, *supra* note 105.

[110] *Id.*

rates.[111] Urgent need for space insurance creates a strong incentive for commercial operators to press for improved space traffic management.[112] This includes traffic rules for active satellites and much stricter space debris guidelines.[113] The risk of damage from debris can be diminished by the improved construction of satellites, the removal of large existing debris and early deorbit of dying satellites, particularly in LEO.[114]

viii. The Effect of Increasing Congestion in Outer Space on Financing Satellites

The retrenchment of the financial market caused by the COVID-19 crisis reduced the previously optimistic space financing market to a much less adventuresome stage.[115] Several previously promising satellite companies have now collapsed because the outer space satellite operations are too risky.[116] OneWeb, a global communications company planned to orbit 648 communication satellites into congested LEO.[117] It managed to launch 74 small satellites into orbit in its effort to provide low cost internet access to developing countries currently without access.[118] However, OneWeb's

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[111] *Id.*

[112] *Id.*

[113] Graham, *supra* note 108.

[114] *See supra* notes 20-44 and accompanying text.

[115] *See* Sandra Erwin, *Venture Capital Is Pulling Back, But Voyager is in for the Long Run*, SPACENEWS (May 31, 2020), https://spacenews.com/venture-capital-is-pulling-back-but-voyager-is-in-for-the-long-run/.

[116] *See, e.g.*, Caleb Henry, *OneWeb Falls Back to Earth*, SPACENEWS (Apr. 20, 2020), https://spacenews.com/oneweb-falls-back-to-earth/; Sarah Barry James & Stefan Joshua Rasay, *3 Satellite Bankruptcies in 3 Months: What Happened and Who Could be Next*, S&P GLOBAL MARKET INTELLIGENCE (June 2, 2020), https://www.spglobal.com/market-intelligence/en/news-insights/latest-news-headlines/3-satellite-bankruptcies-in-3-months-what-happened-and-who-could-be-next-58854554.

[117] *OneWeb Successfully Launches 34 More Satellites into Orbit*, ONEWEB (Feb. 7, 2020), https://www.oneweb.world/media-center/oneweb-successfully-launches-34-more-satellites-into-orbit.

[118] O*neWeb Files for Chapter 11 Restructuring to Execute Sales Process*, ONEWEB (Mar. 27, 2020), https://www.oneweb.world/media-center/oneweb-files-for-chapter-11-restructuring-to-execute-sale-process. Subsequently, the US bankruptcy court approved the UK government purchasing 45% controlling stake in the bankrupt estate. Other financiers plan to contribute additional capital, thus permitting OneWeb to continue operation. *See* Stanley Reed, *Britain Gambles on a Bankrupt Satellite Operator, OneWeb*, N.Y. TIMES (July 10, 2020), https://www.nytimes.com/2020/07/10/business/britain-oneweb.html.

main financier, Japanese Soft Bank, stopped its multibillion investment in OneWeb, when it had to retrench because of COVID-19.[119] Another small satellite operator, LeoSat, has stopped operations for reasons similar to OneWeb's.[120] The financing market has changed. Investment in LEO companies such as OneWeb, is risky for previously willing financiers.[121] The consequences of this may be less traffic and less congestion. It also raises the question of who has the responsibility to deorbit the satellites of a bankrupt estate.

ix. Intentional Collisions

The danger of accidental collisions in outer space has significantly increased due to intentional collisions.[122] These intentional collisions have produced a significant amount of space debris that are outer space traffic hazards.[123] During the Cold War, both the US and the Soviet Union caused space debris when they tested their respective ASAT systems by destroying targets in outer space.[124] This intentional destruction is part of the military view of outer space as a "warfighting domain."[125] Currently, causing space debris is contrary to the UN space debris guidelines of 2007, which the US, Russia, China and India officially support.[126] Regardless, in 2007, China tested the efficiency of its anti-satellite (ASAT) missiles by destroying one of its own weather satellites.[127] This intentional

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[119] *See* Alex Sherman & Michael Sheetz, *Softbank is Letting Internet Satellite Company OneWeb File for Bankruptcy, a Sign Masayoshi Son has Learned Lessons from WeWork*, CNBC (Mar. 27, 2020), https://www.cnbc.com/2020/03/27/softbank-to-let-internet-satellite-company-oneweb-file-for-bankruptcy.html.

[120] Henry, *supra* note 116. *See also* Irene Klotz, *One Web Falls*, AVIATION WK. & SPACE TECH., Apr. 6-19, 2020, at 28, https://aviationweek.com/sites/default/files/2020-04/AWST_200406.pdf. The UK government subsequently purchased the bankrupt estate intending to convert OneWeb into an international GNSS system. *See* Tony Osborne, *OneWeb Could Pave Way to U.K. Sovereign GNSS*, AVIATION WK. & SPACE TECH., July 13-26, 2020, at 70, https://aviationweek.com/sites/default/files/2020-07/AWST_200713.pdf.

[121] Klotz, *supra* note 120.

[122] *See* Laura Grego, *A History of Anti-Satellite Programs*, UNION OF CONCERNED SCIENTISTS (Jan. 2020), https://www.ucsusa.org/resources/history-anti-satellite-programs.

[123] *Id.*

[124] *Id.*

[125] *See supra* notes 36-43 and accompanying text.

[126] *See id.*

[127] *See* Ajey Lele, *The Implications of India's ASAT Test*, SPACE REV. (Apr. 1, 2019), https://www.thespacereview.com/article/3686/1.

collision in LEO produced thousands of pieces of space debris which are now collision dangers.[128] These space debris need to be tracked and avoided.[129] Similarly, in 2019, India caused significant amounts of dangerous space debris when it tested its ASAT system by destroying a satellite in LEO.[130]

x. Registration of Space Objects

Knowing the orbital location of space objects enables satellite operators to avoid collisions if the satellite can change orbit.[131] The United Nation Convention on Registration of Objects Launched into Outer Space (Registration Convention) requires the launching State to register the location of their satellites in their national registry and in the publicly available UN Registry.[132] The Registration Convention, Article 1, defines launching States as the State which launches or procures the launch as well as the State from whose territory or facility a space object is actually launched.[133] Registration determines which State exercises jurisdiction and control.[134] Registration identifies the location of satellites for purposes of traffic avoidance and liability.[135] The most important feature of the registration may well be identification of the space object and the liable State. A significant number (7%) of space objects remain unregistered. Thus, unregistered space objects leave satellite operators in uncertainty regarding State liability, control and jurisdiction.[136] Moreover, international registration is often late, which increases uncertainty while the existence of these unregistered space objects is unknown to other operators.[137]

An even greater collision danger is the general failure of States to register space debris in the international register.[138] Satellites

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[128] *Id.*

[129] *Id.*

[130] *Id.*

[131] LYALL & LARSEN, *supra* note 19, at 78-95.

[132] 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].

[133] *Id.* at art. I.

[134] *See* Outer Space Treaty, *supra* note 3, art. VIII.

[135] Paul B. Larsen, *Small Satellite Legal Issues*, 82 J. AIR L. & COM. 275, 289 (2017).

[136] LYALL & LARSEN, *supra* note 19, at 83.

[137] *Id.*

[138] *See* Outer Space Treaty, *supra* note 3, art. VIII (specifically providing that States have jurisdiction and control over registered space objects). Note that at an early stage,

may be too small to be tracked by the CSpOC and thus are particularly dangerous collision hazards if left unregistered.[139] Bin Cheng adds that if a space object is not registered, it may not be entitled to the protection of a State for its existence in outer space.[140] Within the US, implementation of the Registration Convention has not been delegated to any specific US Government Agency.[141] The US Department of State processes registration after verification that the US is the launching State.[142]

B. Department of Defense Tracking of Space Objects

Tracking outer space debris and operational space objects is an important means for operators to avoid large, hazardous objects.[143] While other strategies exist for avoiding collisions in outer space, at this time, tracking is *the* major space traffic management strategy.[144] The DOD, as we will see below, provides a significant amount of tracking for both civilian and State entities. The DOD would, however, like to disengage itself from responsibility for civilian space traffic.[145] So far, such disengagement has not been successful.[146]

The CSpOC tracks space objects regardless of national origin.[147] It constantly tracks approximately 23,000 space objects, both active and defunct satellites moving at a speed of up to 17,000 miles per hour.[148] Depending on their distance from Earth, the CSpOC system can only track the largest space objects.[149] More

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the United States did register space debris caused by U.S. registered space objects, but subsequently ceased such registration. *See* LYALL & LARSEN, *supra* note 19, at 75-116.

[139] *Id.*

[140] CHENG, *supra* note 12, at 625.

[141] LYALL & LARSEN, *supra* note 19, at 80.

[142] *Id.*

[143] *See* Garber & Herron, *supra* note 8.

[144] *See Space Traffic Management Standards*, *supra* note 2, at 364-65.

[145] *See* Garber & Herron, *supra* note 8.

[146] *See* Joint Force Space Component Command Public Affairs, *Combined Space Operations Center Established at Vandenberg AFB*, U.S. STRATEGIC COMMAND (July 19, 2018), https://www.stratcom.mil/Media/News/News-Article-View/Article/1579497/combined-space-operations-center-established-at-vandenberg-afb/. CSpOC does not specifically monitor or report debris collisions.

[147] *See id.*

[148] *Space Debris and Space Traffic Management*, AEROSPACE (Nov. 14, 2018), https://aerospace.org/article/space-debris-and-space-traffic-management.

[149] *Id.*

than one million objects, including active satellites and space debris, need to be tracked.[150] Although CSpOC is part of DOD, it tracks both military and civilian objects.[151] It is a great safety advantage to commercial space traffic that DOD is willing to share its tracking of civilian space objects.[152] CSpOC will warn satellite operators of likely collisions of satellites, thus enabling civilian operators to change the orbit of their satellites, if they can be maneuvered.[153] CSpoC tracking is free to all users.[154] The absence of a contractual relationship may lower risk of liability for the US government if negligent tracking occurs.[155] Transfer of civilian space tracking to a civilian agency such as the FAA, which tracks aircraft, is favored by both civilians and military, but government funding for civilian tracking has not been appropriated by Congress. Currently, CSpOC tracking technology is being substantially upgraded, enabling the system to track hundreds of thousands of space objects. The new tracking technology, Space Fence, will be able to track space objects in LEO as small as a marble.[156] Other governments, including Russia, China and European countries in the ESA, also track objects in outer space.[157]

C. Space Traffic Management Effect on Long Term Sustainability

Outer space traffic collisions and near misses have an adverse, debilitating effect on long term sustainability. STM is therefore part of COPUOS' adopted guidelines for long term sustainability.

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[150] *Space Debris by the Numbers*, ESA (Feb. 2020), https://www.esa.int/Safety_Security/Space_Debris/Space_debris_by_the_numbers.

[151] *See* Rachael S. Cohen*, Building a More Global Space Force,* AIR FORCE MAG. (Feb. 25, 2020), https://www.airforcemag.com/building-a-more-global-space-force/.

[152] *Id.*

[153] *See* Joint Force Space Component Command Public Affairs, *supra* note 146.

[154] *See* Garber & Herron, *supra* note 8.

[155] *See id.*

[156] Sandra Erwin, *Space Fence Surveillance Radar Site Declared Operational*, SPACENEWS (Mar. 28, 2020), https://spacenews.com/space-fence-surveillance-radar-site-declared-operational/.

[157] *See Space Surveillance and Tracking-SST Segment,* ESA, https://www.esa.int/Safety_Security/Space_Surveillance_and_Tracking_-_SST_Segment (last visited Oct. 2, 2020); *Uzbekistan, Russia to Sign Suffa Observatory Completion Plan*, THE TASHKENT TIMES (Oct. 16, 2018), https://tashkenttimes.uz/science/3038-uzbekistan-russia-to-sign-suffa-observatory-completion-road-map.

In adopting the COPUOS sustainability guidelines States, including the US, made a first step towards establishing international STM guidelines, because the guidelines recognize that:

> 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.[158]

The following Guidelines all affect or relate to international STM:

- Guideline A.2. States should implement the 2007 COPUOS Space Debris Guidelines.

- Guideline A.3. States should require their non-governmental operators to carefully assess and mitigate all risks related to their operations.

- Guideline A.4. States should observe ITU Art. 44 stating that radiofrequencies are limited natural resources that must be used rationally, efficiently and economically in accordance with the ITU radio regulations; they should comply with ITU Art 45 prohibiting interference with radio frequencies. Furthermore space objects should be deorbited or be placed in graveyard orbits in controlled fashion at the end of their lives.

- Guideline A. 5. States should improve space traffic safety through orderly and speedy registration of space objects in compliance with UNGA Res, 1721 B (XVI) and 62/101.

- Guideline B.1. States should improve safety by efficient exchanges of information about actual and probable collisions and near-misses. Adoption of safety standards is recommended.

- Guideline B.2. States should improve information accuracy, and consequent predictability and prevention of potential collisions.

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[158] COPUOS Sixty-Second Session, *supra* note 9, at 12-21. *See also* SPACE SUSTAINABILITY, *supra* note 21 (emphasis added).

- Guideline B.3. States should share space debris monitoring information.

- Guideline B.4. States should perform collision assessments during all the orbital phases of controlled flight and should share such information.

- Guideline B.5. States should require launch operators to make pre-launch assessment of potential collisions. Furthermore, States should develop international standards for use in making such pre-launch assessments.

- Guideline B.6. States should share weather data and forecasts to improve safety of flight in outer space.

- Guideline B.7. States should develop weather models and record space weather patterns to improve safety of flight in outer space. States should develop international standards and recommended practices and procedures for mitigation of space weather effects on satellite design.

- Guideline B.8. States should promote satellite designs that will improve the trackability of space objects. The focus is particularly on small satellites that are difficult to track.

- Guideline B.9. States should require information procedures and channels for forecasted uncontrolled re-entry of potentially hazardous space objects and for mitigation of such events.

- Guideline B.9. States should apply precautionary measures when using laser beams in outer space.

- Guideline D.2 States should improve their mitigation of dangerous space debris.[159]

The COPUOS guidelines may not have binding effect on satellite operators, unless the States decide to adopt them as mandatory regulations; however, they tend to state and clarify desirable objectives for States and international organizations to reach.

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[159] *See* COPUOS Sixty-Second Session, *supra* note 9, at 54-69.

II. NON-SOVEREIGNTY IN OUTER SPACE

To illustrate the outer space sovereignty issue, Bin Cheng compared space traffic management with air traffic management.[160] Both require basic traffic rules in order to avoid collisions.[161] States have sovereign rights in air space above their territories.[162] Airspace over the high seas, however, is not subject to sovereignty.[163] Cheng explains that international airspace, like international oceans, is *res extra commercium* (not subject to national appropriation but open to use by all).[164] To promote safety in international air space, States negotiated the Chicago Convention which established ICAO to control airspace over the high seas.[165] ICAO established the basic standards and recommended practices for non-sovereign airspace.[166] The ICAO flight rules are enforced by the member States.[167] ICAO organization of airspace flight works well because virtually all the States are members of the Chicago Convention and of ICAO.[168] While these rules do not apply to military traffic, the military complies with the civilian flight rules for safety.[169]

One major sovereignty difference between the Chicago Convention and the Outer Space Treaty is that the Chicago Convention defines non-sovereignty in international airspace and then proceeds to establish basic rules for traffic in that space.[170] The Outer Space Treaty merely defines non-sovereign outer space without establishing basic traffic rules for traffic in that space.[171] This has left a vacuum which individual States, like the US seek to fill

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160 *See* CHENG, *supra* note 12, at 400-01.

161 *See id.*

162 *See* Outer Space Treaty, *supra* note 3, art. II. *See also* LYALL & LARSEN, *supra* note 19, at 55-59; CHENG, *supra* note 12, at 400-01.

163 *See also* LYALL & LARSEN, *supra* note 19, at 55-59; CHENG, *supra* note 12, at 400-01.

164 CHENG, *supra* note 12, at 400-01.

165 *See id.* States could exploit the ambiguity concerning the delineation of the border between airspace and outer space to establish special STM in those high altitudes in order to overcome sovereignty problem. *See* Ruth E. Stilwell et al., *Overcoming Sovereignty for Space Traffic Management*, 7 J. SPACE SAFETY ENG'G 158 (2020).

166 *See* Ruth E. Stilwell et al., *supra* note 165.

167 *See* CHENG, *supra* note 12, at 400-01.

168 *The History of ICAO and Chicago Convention*, ICAO, https://www.icao.int/about-icao/History/Pages/default.aspx (last visited Oct. 14, 2020).

169 *See* CHENG, *supra* note 12, at 400-01.

170 *See* Chicago Convention, *supra* note 7.

171 *See* Outer Space Treaty, *supra* note 3, arts. I, II.

unilaterally in order to protect all US space traffic.[172] According to Article VIII of the Outer Space Treaty, national outer space traffic management only governs space objects registered to that country leaving other States to control their own national space traffic.[173] Left solely to the traffic control of their national State of registry, foreign space objects become traffic hazards headed for possible collision with US registered space objects and US registered space objects become traffic hazards to space objects controlled by other States.[174]

Bin Cheng points to Article III of the Outer Space Treaty to illustrate the law which governs traffic in non-sovereign outer space. Article III states that in outer space:

> States Parties to the treaty shall 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 cooperation and understanding . . . .[175]

Significantly, Cheng concludes his explanation of the meaning of Article II by stating: "[t]he concept of non-appropriation embodied in Article II is the same as that which has been traditionally applied to the high seas."[176] In his view, Article II of the Outer Space Treaty permits limited State exercise of jurisdiction in order to prevent lawlessness. [177] The US representative to the Outer Space Treaty negotiations, Paul Dembling, agreed that Article II establishes a limited exercise of national jurisdiction in outer space.[178]

The legal authority of States to regulate national traffic in outer space is fundamental to the regulation of all traffic in outer

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[172] *See* Space Policy Directive-3, *supra* note 2; Space Policy Directive-4, *supra* note 54.

[173] *See* Outer Space Treaty, *supra* note 3, art. VIII ("A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object and over any personnel thereof while in outer space . . . ."). *See also* CHENG, *supra* note 12, at 251.

[174] CHENG, *supra* note 12, at 230.

[175] *Id.*

[176] *Id.*

[177] *Id.*

[178] 1 MANUAL ON SPACE LAW 72 (Nandasiri Jasentuliyana & Roy S.K. Lee eds., 1979).

space. Individual States can legitimately regulate all satellite traffic they authorize and register. These States, however, cannot control outer space outside of their sovereign territory,[179] nor can they control satellites registered in other countries. Other States have equal rights of use and control of their State satellites in non-sovereign outer space.[180] They will be likely to exercise their equality to their advantage.

Article I of the Outer Space Treaty provides that the use of outer space is free for every one and that outer space shall be used for the benefit of all States.[181] Article II takes the sovereignty discussion one step further by establishing 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."[182]

Therefore, Article II limits authority to control the nationally mixed traffic in outer space and particularly limits attempts at national exercise of control and jurisdiction over outer space traffic of other nations. Consequently, agreement among States will be necessary to establish complete international space traffic management similar to that established in air and maritime traffic.

III. SPACE TRAFFIC MANAGEMENT OPTIONS[183]

A. Current US Space Traffic Management

Congestion in outer space is growing rapidly. Space traffic needs traffic rules, practices, procedures and management. A comprehensive space traffic regime is needed that includes all collision-related activities and is complied with by all national and international parties. Establishment of such a regime appears to be waiting for catastrophic collisions to motivate action. The situation is not unlike the situation before the 1956 Grand Canyon air traffic collision between two major US airlines in uncontrolled air space

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[179] *See* Outer Space Treaty, *supra* note 3, art. II.

[180] *See* Registration Convention, *supra* note 132, art II.

[181] *See* Outer Space Treaty, *supra* note 3, art I.

[182] *Id.* at art. II.

[183] For a more extensive discussion of STM options, *see Minimum International Norms*, *supra* note 2, at 775-84.

over the US. That collision led to the formation of the FAA and to unified air traffic control.[184]

Briefly recapping from Part One, space traffic collision-elements are: (1) the planned ten-fold increase of commercial satellites by 2030; (2) the volume of space debris and the concomitant collision danger in LEO that are growing much faster than the number of the civilian and military active satellites; (3) the legal and technical inability of non-governmental operators to establish unified traffic control sufficient to prevent conjunctions; (4) the reluctance of military authorities (CSpOC) to continue their tracking and control of civilian traffic, including sharing information about possible conjunctions; (5) the urgent need for a single lead space agency in the US and failure of FAA launch licensing authority to become fully authorized to control space traffic; (6) the improper devolution of responsibility for safety functions upon the FCC; (7) the failure to shift compliance responsibility from the Department of State to other executive departments; (8) the FCC's concern that non-governmental operators may not have obtained adequate insurance to pay for damages that their collisions may cause; (9) current registration practice that omits registration of space debris, which may be the greatest collision danger; (10) the space insurance companies' realization that insurance of the non-governmental operations is too risky; (11) the growing inability of financiers to absorb the risks of collision-prone commercial satellite operators; and (12) the intentional destruction of satellites by China and India causing space debris that adds to the danger of collision. All these and other elements need to be coordinated into one uniform international outer space traffic management system. There is urgent need for unified international traffic regulation of all the objects moving in outer space.

B. Evaluation of Current US STM Structure

Satellite operators as well as governments currently rely on multiple sources of space traffic information. However, the increasing risks of collisions and dangerous near-collisions indicate the

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[184] *See* PAUL B. LARSEN ET AL., *Chapter 13: The U.S. Federal Aviation Administration*, *in* AVIATION LAW: CASES, LAWS AND RELATED SOURCES 971-1058 (2012).).

need for significant improvement of traffic safety. [185] It is evident that a successful global space traffic management system will require close coordination with other countries because of non-sovereignty in outer space.[186] COPUOS is far from an effective international STM system. There is national and international agreement that the existing disparate space traffic management systems do not meet the requirements of the new space age. A comprehensive international space traffic management is needed.

Presidential Directives-3 recognizes the dangerous nature of traffic in outer space.[187] It accepts the need for uniform space traffic management rules. It promotes US nationally uniform space traffic rules.[188] It aims for the US national rules to become accepted internationally by all other nations, to become the international uniform rules.[189] Without input and cooperation from other countries expressing their special needs, it is going to be difficult if not impossible to create international uniform space traffic management in non-sovereign outer space. It will require international negotiation and cooperation for that to happen. Even an international space traffic system encompassing a few States will not assure safe traffic in outer space. One national system, like a US national STM system, or a partial international STM system of only a few States, would only result in conflicts. Participation of virtually all the States is necessary for a successful internationally uniform STM.

C. Conclusion

Presidential Directive-3 tends to leave too much STM safety management authority with individual satellite operators. The Directive's mitigation of space debris is insufficient to resolve the crucial space debris problem. Most importantly, it is unlikely that it can convince other States to join the national uniform traffic system of the US. International coordination is needed to establish international uniform STM.[190]

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[185] *See* Garber & Herron, *supra* note 8.

[186] *See* Outer Space Treaty, *supra* note 3, art. II; IAA STM STUDY, *supra* note 8, at 53.

[187] *See Space* Policy Directive-3, *supra* note 2.

[188] *Id.*

[189] *Id.*

[190] *See* Garber & Herron, *supra* note 8.

IV. 2018 INTERNATIONAL ACADEMY OF ASTRONAUTICS STM MODEL

The International Academy of Astronautics (IAA) study rests on the voluntary space traffic rules named Space Situational Awareness (SSA).[191] SSA depends on detection and identification of collision dangers such as space debris, other orbiting satellites and other space variables such as space weather and the maneuvers of other space objects.[192] Success of SSA depends on the accuracy and volume of available data.[193] However current tracking technology is not able to track and identify very small space objects, most of which are space debris. The increasingly higher volume of objects in outer space may not be adequately identified and tracked and information may not be adequately shared for national security reasons.[194] Thus collision dangers are increasing. DOD CSpOC and the Russian Space Surveillance System (SSS) are evidently very important for SSA-based space traffic as are other tracking systems.[195] But space traffic management based on national availability of traffic data is not reliable because it may leave out necessary information about the locations and movements of the space objects of other nations. Furthermore, the SSA system is basically a voluntary system. Safe traffic in outer space requires mandatory delivery of all relevant information. Consequently, the current SSA system is not sufficient for the new space age traffic. An international intergovernmental STM regime is needed.

A. STM on the ITU Model [196]

The international STM framework proposed by the 2018 IAA study rests on implementation of the five basic space law treaties. It is based on acceptance and continuance of the institutional forum COPUOS, which has been the international coordinator for space traffic issues since the beginning of the space age. It is an advantage that COPUOS is a UN General Assembly Committee. Thus, it has natural coordination with relevant UN specialized agencies such as

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191 IAA STM STUDY, *supra* note 8, at 12.
192 *Id.*
193 *Id.* at 94.
194 *Id.* at 95.
195 *Id.* at 97.
196 *Id.* at 101.

ICAO, International Maritime Organization (IMO), ITU and the World Meteorological Organization (WMO). Virtually all the States concerned with space traffic coordination are active in COPUOS and in the other UN specialized agencies. States can easily convene in COPUOS to negotiate international agreements.

The layered organizational structures of the ITU are the model for the IAA proposal. The IAA study proposes a three – layered structure: (a) a basic treaty, (b) mandatory outer space traffic rules like the ITU radio regulations which could regularly be updated by periodic world-wide assemblies to accommodate new traffic problems, and (c) technical standards and recommended practices.[197]

i. New International Space Law [198]

In a nutshell, a new law would rest on the basic legal principles currently established in the five space law treaties. The treaties would be updated as required by current needs. The new treaty provisions would (1) reformulate the definitions of 'space object' to clarify whether space debris is a space object, (2) redefine outer space to explain whether "near space" is part of outer space,[199] and (3) define space activity. The objective would be to clarify the applicability of space law to specific space activities.

The new treaty provisions would restate the prohibition on national appropriation and sovereignty in outer space to provide that STM must comply with this basic principle. They would maintain the basic freedoms of exploration and use, as well as peaceful uses of outer space; space debris removal would be declared a peaceful use. They would prohibit interference with use of limited space resources such as radio frequencies, orbital slots, space debris mitigation and removal, and scientific experiments. Interference with space traffic would be prohibited. Developing countries would be favored. States would be held internationally responsible for their space activities and for the space activities of their authorized non-governmental entities. The liability regime would be redefined. Registration of space objects would be required. States would have to inform each other of their orbital traffic maneuvers. Basic

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[197] IAA STM STUDY, *supra* note 8, at 17.

[198] *Id.* at 133

[199] *See* Stilwell et al., *supra* note 165.

information exchange regarding space situational awareness and space weather services would be established. The treaty would require space traffic coordination. It would establish an international space organization to administer a space traffic management regime. This organization would have a council and regularly scheduled traffic conferences, which would have decision-making authority. It would administer outer space traffic management rules. The organization would have a standing administrative secretariat to be funded by the member States in the same way the ITU is currently funded.

ii. Outer Space Traffic Rules

The model for space traffic rules would be the ITU radio regulations. That is, the space traffic rules would apply globally like treaty provisions to be implemented by the national governments. They would be reviewed and updated by States at world conferences at three-to-four-year intervals. The conferences would establish registration requirements.

The traffic rules would administer traffic separation, scheduling, navigation routes, and passage through air space. The rules would allocate orbital slots and define operational behavior. The rules would be different for small satellites than for large satellites. They would regulate traffic data sharing. The rules would regulate transportation safety and liability. The ITU STM model also suggest that there would also be environmental rules regarding space debris mitigation, debris removal, return to the launching State, remote sensing, and exploitation of resources.

iii. Outer Space Technical Standards [200]

The IAA study proposes establishment of technical standards for engineering of spacecraft, data systems, flight safety, ground services disposal of defunct space objects, management of projects, assurance of quality, and sharing of space situational data and services. The standards would be reviewed by space traffic experts at the planned periodic world conferences of States. However, there would also be preparatory meetings of experts between world conferences.

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[200] *Id.* at 141.

B. Evaluation of The IAA Proposed Model

The IAA study is a much-needed analysis of the importance of space traffic management and identification of options. It has advanced understanding of the issues and accurately described the urgency of STM in the new space age. In contrast to the US-proposed national space management system, [201] the IAA Study proposes treaty provisions that would establish a specialized UN agency for STM. The treaty would establish world-wide assemblies like the ITU global assemblies which would meet periodically every three or four years. The assemblies would adopt STM regulations as treaty obligations like the ITU radio regulations. The STM regulations would be reviewed and updated at subsequent world assemblies, which may be too slow for quickly developing outer space traffic situations. The absence of a standing assembly, like the ICAO Council, handicaps this model in managing urgencies like sudden catastrophic collisions threatening to foreclose access to outer space.

Successful re-negotiation of STM-related legal definitions and principles established in the existing five space law treaties would be difficult to accomplish. Some States might adopt changes. Others might not. The result would be dis-uniformity of regulation.

The proposed IAA regime appears to leave a large part of space debris management and debris mitigation with COPUOS, where it is presently located.

C. Conclusion

(1) Under the ITU model, important traffic principles would be adopted by periodic world assemblies of States, rather than by STM experts. All delegates to the world assemblies, which function on a one-State-one-vote basis, may not be sufficiently informed to appreciate the urgency of STM proposals by major space powers, and to move swiftly when need arises. States may be slow to adopt new regulations promulgated by the world assembly resulting in lack of uniformity (currently experienced by ITU).

(2) Under the ITU model, a regulatory board would be established to consider less-serious STM issues. Such a board would meet

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[201] *See* Space Policy Directive-2, *supra* note 67; Space Policy Directive-3, *supra* note 2.

four times a year. The 12 board members [202] would be STM experts; they would remain employees of their governments, although their expenses would be paid by the space organization. That may not be a sufficiently independent decision-making authority necessary for STM. More importantly, the ITU Board lacks adequate enforcement authority.

(3) The ITU model would have only one standing body, a Secretariat. Other parts of the decision-making system would remain with the States. Consequently, STM would be less expensive but also less independent, flexible and be slower than under the ICAO model.

(4) The space traffic norms to be stablished under the ITU model would become treaty obligations of the participating States. By contrast the uniform ICAO standards and recommended practices are not treaty obligations requiring advice and consent of Congress. The ICAO model makes it easier to change and update as required by sudden emergencies. The ICAO minimum standards allow States to adopt more extensive safety requirements as long as they do not conflict with the minimum standards. Thus, the ICAO standards are easier, quicker and more convenient to adopt than the IAA proposed rules.

(5) The IAA STM treaty provisions would seek to regulate all aspects of space traffic, military as well as civilian. They would not exclude economic regulatory issues. The scope is too vague and unrealistic to be adopted.

IV. THE ICAO MODEL FAVORED BY BIN CHENG[203]

A. The STM Structure

Much can be learned from the traffic management of international civil aviation which began in World War II. Aircraft technology developed so fast that future civilian air carriage required *international technical safety norms.* Towards that purpose the

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[202] *Radio Regulations Board (RRB)*, INT'L TELECOMM. UNION [ITU], https://www.itu.int/en/ITU-R/conferences/RRB/Pages/default.aspx (last visited September 23, 2020). The twelve members of the Radio Regulations Board are elected at the Plenipotentiary Conference. They perform their duties independently and on a part-time basis, normally meeting up to four times a year in Geneva.

[203] *See* CHENG, *supra* note 12; *Minimum International Norms*, *supra* note 2, at 737.

world's States established the International Civil Aviation Organization (ICAO). Strong growth in outer space traffic[204] places it in a situation similar to post-WWII air traffic. Space traffic management based on the ICAO model would establish international technical norms for traffic in non-sovereign outer space. The norms could be superimposed on the existing legal structure of the five space law treaties and COPUOS. That would not disturb the Outer Space Treaty provision on non-sovereignty and non-appropriation of outer space. Use of the ICAO model would impose a regime of technical traffic norms on top of the existing legal structure that would be left in place.

Under this model, uniform space traffic norms would be established by a small international body with norms applied by the individual States. Disparity of national traffic in outer space would no longer cause collisions and near misses. The national traffic management of each country would not only regulate and control domestic traffic but also foreign traffic in accordance with the new international traffic standards, recommended practices and procedures.[205] That would establish global uniform space traffic rules.

Whether the new international norms would include military space traffic would have to be decided. Civilian and military space traffic are currently closely related. But civilian traffic is booming and developing differently than military traffic. The civilian focus on small satellites signifies developing technological differences from the military where the focus is on sophisticated weaponry. The Convention on International *Civil* Aviation which created ICAO, by its terms does not apply to military traffic. That has resulted in a satisfactory traffic system whereby military traffic follows the civilian traffic rules for the sake of safety, yet the military is free to deviate, if necessary, for military reasons. Another advantage of the separation is to free the military of responsibility for management of civilian traffic. Exception of military traffic would follow the precedent set by the International Telecommunication Union which

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[204] *See* CHENG, *supra* note 12, at 3-88.

[205] *See Minimum International Norms*, *supra* note 2.

also does not regulate military space traffic radiofrequencies and the related orbital slots. [206]

The failure of the 2008 EU-proposed Code of Conduct for Outer Space Activities revealed irreconcilable problems with joint civilian-military space traffic rules.[207] The negotiations failed due to the ambitious idea of controlling both military and civilian traffic causing countries to withhold support for this worthwhile proposal. [208]

Effective international space traffic norms would have to include all potential traffic collision dangers. That would have to include the danger of collision and traffic interferences by space debris.[209] COPUOS has not been able to agree on badly needed strengthening of its 2007 space debris guidelines. As space traffic increases, so does the accumulation of space debris. The inevitable result is more collisions and more debris. Stricter time limits for removal of defunct satellites, tighter construction standards, removal of dangerous debris, registration of known debris and mandatory enforcement of guidelines are needed.[210]

The new international space traffic organization should be a standing organization empowered to establish mandatory norms for both satellites and space debris.[211] The space traffic organization would be a UN specialized agency like ICAO, ITU and IMO. Its function would be to establish traffic and debris standards and recommendations. These would be minimum standards. The international STM organization would delegate international enforcement of the mandatory standards to its member States, the same way ICAO now delegates enforcement of aviation standards to its member States.[212] That would leave States free to adopt more stringent national standards for their own space objects as long as they do not conflict with the minimum standards. Outer space satellite

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[206] *See* ITU CONSTITUTION, *supra* note 6, art. 48. *See also* U.N. Doc. A/RES/502 (VI) (Jan. 11, 1952) (discussing measures to reduce armed forces and armaments to strengthen friendship and peace among the nations).

[207] Paul B. Larsen, *Outer Space Arms Control: Can the USA, Russia and China Make this Happen?*, 23 J. CONFLICT & SEC. L. 137, 150 (2018).

[208] *See supra* notes 20-44 and accompanying text.

[209] *Id.*

[210] *Id.*

[211] *See, e.g.*, Chicago Convention, *supra* note 7, art. 38. Article 38 allows individual ICAO member States to opt out of an international standard if a State finds the standard to be impracticable, but the State must inform ICAO immediately.

[212] Chicago Convention, *supra* note 7, art. 12.

operators would operate in reliance that all space traffic conforms with the minimum international standards. New launches would all comply with the minimum debris standards. Defunct satellites would deorbit or be put into graveyard orbits. Consequently, substantial collision dangers would be greatly diminished, and traffic would be much safer.

The space organization would be governed by a small council of States. The space powers like US, Russia, China, India and Europe (through ESA) would be permanent members of the Council. World-wide constitutive conferences would be convened at regular intervals, perhaps every three years. Council members, other than the permanent members, would be elected. The Council would be authorized to adopt minimum standards, recommended practices and procedures. Drafts would be prepared by a standing panel of experts which would submit the standards to the Council for adoption.

Industry participation would exist (1) through their national government representatives on the space council, (2) by participation in national delegations and, (3) by invitation to contribute their expertise to the panel of experts.

Whatever system is chosen will be expensive, but that is unavoidable. The current traffic regime leads ultimately to traffic paralysis in outer space as indicted by the Kessler syndrome: Failure to act will lead to loss of access to outer space. Therefore, the cost of the organization would easily be worth the reduction in accidents, insurance costs, diminished space debris and safer access to outer space.

The list of uniform international space traffic norms would be established by STM experts. That list would probably include procedural norms for communication, launches, navigation as well as procedures regarding navigable traffic interaction with non-navigable objects such as space debris.[213]

The list of civil uniform international space debris norms would include limits on space debris generation during normal operations by satellites, launch rockets, and their component parts; limits on break-ups during operational phases; norms for diminishment of accidental debris-causing collisions in space as well as

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[213] *See Minimum International Norms*, *supra* note 2, at 752.

required deorbit from low earth orbits within time limits; and required removal from geostationary orbit into graveyard deorbits.[214]

B. Evaluation of The ICAO STM Model

The ICAO flight standards, recommended practices and procedures have been in place since the creation of ICAO in 1947. Their long existence is proof of their success. The ICAO traffic rules are adopted as mandatory rules by all States, unless specifically excepted. An international outer space traffic treaty organization on the ICAO model could produce and constantly update internationally uniform traffic rules for outer space. Like the ICAO aviation rules, the outer space internationally uniform traffic rules would be delegated to the individual States for enforcement. The International space organization would not have to be the operator of STM.

A STM treaty would establish a small standing council of States that would make decisions on recurring satellite and space debris traffic problems. The Council would be supported by panels of STM experts who would draft international standards and recommended practices and procedures for Council decision. The council would be guided by the STM treaty and by periodic global assemblies of States. That proved to be expeditious and effective in aviation. The goal would be for satellite operators to have easy communication with the experts in formulating needed norms for outer space traffic.[215]

The ICAO model would be funded by the member States the same way the ICAO is currently funded.

V. CONCLUSION

(1) The ICAO model would also require the adoption of new treaty provisions—always a daunting and difficult proposition. Such provisions, however, would be easier to adopt than under the IAA model because they would not require reopening the five space law treaties for re-negotiations. Under the ICAO model, a new STM treaty would leave these five treaties in place. It would establish a new special treaty regime limited to STM issues; in other words, the STM treaty would rest on top of the existing treaties, which

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[214] *See id.* at 756.

[215] *See id.* at 750-56.

would continue to govern all remaining international space issues. Thus, all space issues, other than traffic and space debris would remain with COPUOS, which would continue as advisory committee to the UN General Assembly.

(2) Under the ICAO model standards, recommended practices and procedures can be adopted gradually as needs arise. Furthermore, the ICAO model includes an audit program to ensure that the States comply with adopted standards.[216]

(3) The ICAO-model would establish a small standing governing council appointed by member States. The five space powers would be permanent members. A secretariat, as well as panels of STM experts like the ICAO Air Navigation Commission[217] would constantly formulate and draft STM norms and regulations for the standing council to adopt. The long-time success of ICAO has proven that such an organization would operate well for regulation of urgent STM involving outer space traffic of satellites and space debris. Resolution of the space debris problem is the most urgent and also most troublesome issue. It will require considerable time to resolve. [218]

(4) Adoption of the ICAO Model would focus only on civilian STM, which would greatly facilitate negotiations. That would leave military considerations free of international regulation but also free to observe civilian STM.

(5) The ICAO model would focus on space safety issues. Freeing the STM decisionmakers from economic issues would make decision-making much easier. STM decisions focus on collision avoidance. The decision-maker should, therefore, be an expert on safety. Traffic safety is the FAA's mission. It has extensive experience with the ICAO safety regime implementing ICAO standards and recommended practices. Economic regulation should be assigned to the Department of Commerce. [219]

(6) STM on the ICAO Model would be more costly than the ITU model. But the urgency and prospects of the space traffic situation

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[216] *ICAO: Frequently Asked Questions,* ICAO, https://www.icao.int/about-icao/FAQ/Pages/icao-frequently-asked-questions-faq-5.aspx (last visited Sept. 24, 2020).

[217] Chicago Convention, *supra* note 7, arts. 56, 57.

[218] *See* Garber & Herron, *supra* note 8.

[219] 51 U.S.C. § 50914.

requires incurring the greater cost. It must be viewed as a cost of doing business in outer space.

(7) Bin Cheng would favor adoption of the ICAO model, as does this author.

THE ROLE OF SOFT LAW IN PROMOTING THE SUSTAINABILITY AND SECURITY OF SPACE ACTIVITIES

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ABSTRACT

The international legal framework for space activities rests on two pillars: "hard law" and "soft law." The hard law pillar consists of legally binding treaties and the body of customary international law. The soft law pillar comprises non-binding principles, norms, standards or other statements of expected behaviour in the form of resolutions, recommendations, guidelines and codes of conduct. Such is the legal context in which the rapidly expanding and evolving space community finds itself today. There is growing recognition of the need to enhance the governance regime for space activities, particularly as it pertains to the safety and sustainability of space activities, but little appetite in multilateral fora for negotiating new legally binding instruments. At the same time, we are

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witnessing a growing reliance on space by militaries and consequently a proliferation of counterspace capabilities. This has given rise to calls for multilateral instruments to address the politically thorny issue of space security. But here, too, discussions on legally binding instruments have become deadlocked. In this environment, bottom-up soft law approaches may provide an option to make progress in some areas, particularly where consensus can be achieved on various technical and procedural issues and incorporated into non-binding standards and guidelines. In this article, we examine the role of soft law initiatives in the domains of space sustainability and space security. The international community generally addresses the problems of space sustainability and space security as separate areas of concern. This is because the legal and political frameworks that underlie discussions of these two issues in space relate to fundamentally different aspects of relations among States. We discuss a number of soft law initiatives carried out both within and outside of multilateral fora and derive some lessons learnt from these initiatives on the role and limitations of soft law in addressing challenges of space sustainability and space security.

I. INTRODUCTION

This year marks the sixtieth anniversary of the launch of Echo I, the world's first artificial satellite built to relay communication signals from one point on the Earth to another.[1] Launched by NASA on August 12, 1960, Echo I was a thirty-meter aluminized thermoplastic polymer film balloon that served as a passive reflector for radio communications.[2] The approximately sixty-six kilogram satellite,[3] manufactured by G.T. Schjeldahl Company,[4] was launched atop an expendable Thor-Delta rocket from Cape Canaveral.[5] As its

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[1] This satellite is commonly referred to as Echo 1, although strictly speaking this was Echo 1A, since Echo 1 was lost in an unsuccessful launch attempt on May 13, 1960. For a history of the Echo project, *see* JAMES R. HANSEN, SPACEFLIGHT REVOLUTION: NASA LANGLEY RESEARCH CENTER FROM SPUTNIK TO APOLLO 189 (1995), https://history.nasa.gov/SP-4308.pdf.

[2] *Id.* at 187-90.

[3] *Id.* at 187. *See also* Nasa, *Project Echo* (Aug. 13, 2011), https://www.nasa.gov/centers/langley/about/project-echo.html.

[4] HANSEN, *supra* note 1, at 184.

[5] *Id.* at 188.

shiny surface was also reflective in visible light, Echo I was easily visible to the unaided eye over most of the Earth.[6]

Fast-forward almost sixty years to the day, to August 18, 2020, when the eleventh batch of fifty-eight Starlink communication satellites, each with mass of approximately 260 kilograms (and also three Planet Labs Earth observation satellites), were launched from Cape Canaveral on a reusable SpaceX Falcon 9 booster rocket completing its sixth flight.[7] Though much smaller in dimension than Echo I, the Starlink satellites are also readily visible from Earth as a bright train of luminous points in the sky.[8]

When Echo I was launched, the United States and the Soviet Union were the only two countries capable of launching satellites, and there were no purely commercial space activities.[9] At the time of Echo I's launch in August 1960, there were thirteen satellites (both operational and defunct) in Earth orbit.[10] When the eleventh batch of Starlink satellites was launched in August 2020, they entered a much more congested orbital environment, presently occupied by some 3,000 operational satellites, another 3,000 defunct satellites, over 30,000 objects larger than about ten centimeters and some 900,000 objects with sizes in the range of one to ten centimeters.[11] These space objects have been launched by eighty-seven States and intergovernmental organizations.

There are also some interesting legal parallels in this story. At the time Echo I was launched, there was no international legal framework for outer space activities. The Ad Hoc Committee on the

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[6] *Id.* at 161.

[7] Stephen Clark, *SpaceX Adds More Satellites to Ever-Growing Starlink Network*, SPACEFLIGHT NOW (Aug. 18, 2020), https://spaceflightnow.com/2020/08/18/spacex-adds-more-satellites-to-ever-growing-starlink-network/.

[8] Jonathon O'Callaghan, *What Are Those Strange Moving Lights in the Night Sky? Elon Musk's 'Starlink' Satellites Explained*, FORBES (Apr. 21, 2020), https://www.forbes.com/sites/jonathanocallaghan/2020/04/21/what-are-those-strange-moving-lights-in-the-night-sky-elon-musks-starlink-satellites-explained/#2dc9cadd7cbc.

[9] ROGER D. LAUNIUS, HISTORICAL ANALOGS FOR THE STIMULATION OF SPACE COMMERCe 12, 24 (2014), https://history.nasa.gov/monograph54.pdf.

[10] *See Online Index of Objects Launched into Outer Space*, U.N. OFF. OUTER SPACE AFF., https://www.unoosa.org/oosa/osoindex/search-ng.jspx?lf_id= (last visited Nov. 12, 2020).

[11] *See ESA's Annual Space Environment Report*, ESA SPACE DEBRIS OFF. (Sept. 29, 2020), https://www.sdo.esoc.esa.int/environment_report/Space_Environment_Report_latest.pdf.

Peaceful Uses of Outer Space (Ad Hoc Committee) was established by UN General Assembly Resolution 1348 (XIII) of 13 December 1958.[12] The eighteen Member States comprising this Ad Hoc Committee began work on 6 May 1959.[13] By the terms of its founding resolution, the Ad Hoc Committee was mandated, inter alia, to consider:

> (c) The future organizational arrangements to facilitate international co-operation in this field within the framework of the United Nations; [and]
>
> (d) The nature of legal problems which may arise in the carrying out of programmes to explore outer space[.][14]

The report of the Ad Hoc Committee, which addresses these two items makes for some interesting reading. Already in its earliest deliberations the Ad Hoc Committee noted that "activities in, or connected with the exploration [of], outer space had been generally regarded as compatible with the principle that outer space is freely available for exploration and use by all."[15] There was already an appreciation among States that "the progress of activities in outer space and of advances in science and technology would continually pose new problems relevant to the international legal order and modify both the character and the relative importance of existing problems."[16] The Ad Hoc Committee "also recognized the need both to take timely, constructive action and to make the law of space responsive to the facts of space."[17]

The report then proceeded to outline a number of legal problems for priority treatment.[18] These point to a number of principles that underpin the current international legal framework for space activities. The analysis contained in the report was prescient in

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[12] G.A. Res. 1348 (XIII), ¶ 1 (Dec. 13, 1958).

[13] Rep. of the Ad Hoc Comm. on the Peaceful Uses of Outer Space, U.N. Doc. A/4141, at 3 (1959).

[14] G.A. Res. 1348, *supra* note 12, ¶ 1.

[15] Ad Hoc Comm. on the Peaceful Uses of Outer Space, Draft Rep. of the Legal Comm., U.N. Doc. A/AC.98/C.2/WP.05 (1959).

[16] Ad Hoc Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Comm., U.N. Doc. A/AC.98/L.07 (1959).

[17] Rep. of the Ad Hoc Comm. on the Peaceful Uses of Outer Space, *supra* note 13, at 23.

[18] *Id.*

several respects. For example, the Ad Hoc Committee envisaged that one serious problem that would require management was "the potential overloading of tracking facilities by an excess of space vehicles or by the launching of space vehicles indiscriminately, without coordination and without registration."[19] Nowadays, we would refer to this as pointing to a need for space traffic coordination and/or management.

The Ad Hoc Committee advocated a cautious approach towards the codification of a comprehensive set of norms for activities in outer space, both to avoid giving an illusion of certainty where none existed and to avoid prematurely establishing principles that might, with experience, later prove to be inappropriate.[20] Discussions on legal questions continued and by 1962 the General Assembly was able to agree on the Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space,[21] which encapsulates the core elements subsequently codified in the Outer Space Treaty of 1967[22] (Outer Space Treaty). This has necessarily been a very abridged discussion of the very interesting formative stage of international space law, with just enough detail to set the scene for the discussion that follows.[23]

The point of relating this story in the context of this article on the role of soft law in promoting the sustainability, stability and security of space activities is to show the role that soft law played in guiding the behavior of States before the adoption of the 1967 Outer Space Treaty. The Outer Space Treaty was essentially a codification of these same principles, which were then further developed in the succeeding space treaties[24] (together, with the Outer

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[19] *Id.* at 24.

[20] BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 128-30 (1997).

[21] G.A. Res. 1962 (XVIII), Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space (Dec. 13, 1963) [hereinafter Declaration of Legal Principles]. *See also* CHENG, *supra* note 20, at 142-46 (discussing the meaning of the declaration and its non-binding nature in these documents).

[22] 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].

[23] *See* CHENG, *supra* note 20, at 125-49 (detailing the early history of United Nations efforts toward law-making in outer space and advancing Cheng's theories concerning the development of customary international space law).

[24] The United Nations treaties on outer space encompass five treaties adopted in the United Nations General Assembly: (i) the Outer Space Treaty, *supra* note 22; (ii) the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of

Space Treaty, collectively referred to as the Space Treaties) It also serves to illustrate that, when it comes to legal certainty on space activities, there are still many open questions today, just as there were in 1960, and that the caveats noted by the Ad Hoc Committee about not rushing into negotiating legally binding norms are just as relevant today as they were back then.[25]

Today, we are in a similar situation regarding the many legal questions posed by the rapid development of space activities. Whereas in the early days of the Space Age, space activities were dominated by a few State actors, nowadays there is a rapidly increasing number of non-State actors (especially commercial entities) entering the space arena.[26] These new actors are developing completely new kinds of space activities involving close-proximity operations in space, such as on-orbit servicing, life-extension, post-mission disposal and others.[27] The technical capabilities that underpin these new kinds of space activities have raised concerns because of their dual-use potential for counterspace applications.[28]

The increasing congestion in the space environment from operational satellites, defunct satellites and other forms of space debris, is posing some serious challenges to the safety of space operations. According to some projections, the number of operational satellites in Earth orbit could easily increase by an order of magnitude over the next decade, elevating the importance of space traffic coordination and management for collision avoidance.[29] Adding to this

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Objects Launched into Outer Space, April 22, 1968, 19 U.S.T. 7570, 672 U.N.T.S. 119; (iii) Convention on International Liability for Damage Caused by Space Objects, March 29, 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187; (iv) the Convention on Registration of Objects Launched into Outer Space, June 6, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15; and (v) Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement].

[25] CHENG, *supra* note 20, at 142-46.

[26] *See* Mitigation of Orbital Debris in the New Space Age, 85 Fed. Reg. 52,422, 52,424 (Aug. 25, 2020).

[27] *See id.*

[28] *See* Jakub Pražák, *Dual-use Conumdrum: Towards the Weasponization of Outer Space?,* ACTA ASTRONAUTICA (Dec. 28, 2020), https://www.sciencedirect.com/science/article/pii/S0094576520307943?casa_token=Tpc2PKu6eSEAAAAA:1he6xU-UHuGiUSmJB1tIywK29ndh-D0wrqtTpd0Z9y88QQfZw1PyD-OQROoDUoC6o84QFfRrq_Q.

[29] Tate Ryan-Mosely, Erin Winick &Konstantin Kakaes, *The Number of Satellites Orbiting Earth Could Quintuple in the Next Decade*, MIT TECH. REV. (June 26, 2019), https://www.technologyreview.com/2019/06/26/755/satellite-constellations-orbiting-earth-quintuple/.

already large number of maneuverable spacecraft a much larger number of non-maneuverable debris objects, one quickly reaches the conclusion that satellites of the future will need to rely on some form of autonomous on-board collision avoidance capability. However, with increased maneuverability comes increased unpredictability of satellite positions, and this will drive the need for increased data sharing on space objects and events.

States are also becoming increasingly reliant on space systems for their national security, and a growing number are taking steps to protect their own military space systems while at the same time developing capabilities to deny the use of, destroy or disable the military space systems of potential adversaries. This finds expression in the development of military doctrines on space as an operational domain, the establishment of military space forces and the development of a variety of ground-based and space-based counterspace capabilities. The testing of such counterspace capabilities (especially kinetic antisatellite weapons) can generate huge amounts of long-lived debris that poses a risk to the safety of space operations for many other space actors.[30]

Another theme that has emerged in recent years concerns the utilization of space resources, an area fraught with open legal questions. This is underscored by the fact that only eighteen countries have ratified or acceded to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies[31] (Moon Agreement), which purports to address this issue. None of the eighteen participating countries are considering or planning such activities on the Moon in the foreseeable future.[32] The use of extraterrestrial resources is a *sine qua non* to support a permanent human presence

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[30] For an overview of these emerging counterspace capabilities, *see* GLOBAL COUNTERSPACE CAPABILITIES: AN OPEN-SOURCE ASSESSMENT (Brian Weeden & Victoria Samson, eds., Apr. 2020), https://swfound.org/media/206970/swf_counterspace2020_electronic_final.pdf.

[31] Moon Agreement, *supra* note 24, art. 11.

[32] *See* Comm. On the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. On Its Sixty-Second Session, U.N. Doc. A74/20 (June 12-21, 2019); Comm. on the Peaceful Uses of Outer Space, Legal Subcomm., Note by the Secretariat, *Activities Being Carried Out or to be Carried Out on the Moon and Other Celestial Bodies, International and National Rules Governing Those Activities and Information Received from States Parties to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies About the Benefits of Adherence to that Agreement*, U.N. Doc A/AC.105/C.2/L.271 (Jan. 25, 2008) [hereinafter Moon Agreement Information].

in space and on other celestial bodies. While the topic of space resource utilization falls outside the scope of this paper, it, too, is the subject of soft law discussions as a pragmatic way of making progress on this issue, given the lack of broad support for the Moon Agreement. None of the three major space powers has ratified the Moon Agreement.[33] On April 6, 2020, President Trump Executive Order 13914, Encouraging International Support for the Recovery and Use of Space Resources, clearly indicates that the United States does not see further discussion of the Moon Agreement as fruitful. Instead, the Executive Order addresses access to, and use of, lunar resources through the Outer Space Treaty and bilateral instruments such as the Artemis Accords.[34] Current plans for a return of human explorers to the Moon call for the utilization of lunar resources, possibly to be provided by commercial actors.[35] Even if China or Russia were to give political weight to the Moon Agreement by ratifying it before the United States lands humans on the Moon (which seems unlikely), the United States would still have a strong first-mover advantage.

The existing treaty-based international legal framework for outer space activities does not cover situations that arise from many of these emerging challenges. In each case, there have been calls to develop binding legal instruments to address these challenges, but there is no consensus around such an approach. In this article, we discuss some of the recent attempts to address the growing concerns of space safety, space sustainability and space security through non-binding soft-law approaches. We begin with a brief discussion of some of the features of soft law and current soft-law instruments that address the topic of this article. We then review recent soft law initiatives in space sustainability and space security, some of which have resulted in successful negotiations while others have not. Finally, we conclude with some lessons learnt from these initiatives

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[33] *See* Comm. On the Peaceful Uses of Outer Space, Legal Subcomm., *Status of International Agreements Relating to Activities in Outer Space as at 1 January 2019*, Fifty-Eighth Session, U.N. Doc. A/AC.105/C.2/2019/CRP.3 (Apr. 1, 2019).

[34] Exec. Order No. 13914, 85 Fed. Reg. 20,381 (Apr. 6, 2020).

[35] *See* Christian Davenport, *NASA Announces It's Looking for Companies to Help Mine the Moon*, WASH. POST (Sept. 10, 2020), https://www.washingtonpost.com/technology/2020/09/10/moon-mining-nasa-search/?hpid=hp_hp-more-top-stories-2_moonmining-1240pm%3Ahomepage%2Fstory-ans.

and thoughts on the role of soft law in addressing space sustainability and space security challenges.

II. CHARACTERISTICS OF SOFT LAW IN THE SPACE DOMAIN

In Part I, we recalled several key principles from the early days of space exploration set forth in non-binding UN General Assembly resolutions that were subsequently codified in legally binding multilateral agreements governing the activities of States in outer space. In this section, we discuss the legal effect of these non-binding soft law instruments in a bit more detail.

First, one may observe that although soft-law instruments are *non-binding*, this does not mean they are *non-legal*. Although soft law may not be legally binding, State actors may regard it as politically binding. States that adopt a soft law instrument may choose to demonstrate their political commitment to the instrument by implementing its provisions in their national regulatory frameworks for outer space activities. Such has been the case. For example, a number of States have implemented elements of the UN Space Debris Mitigation Guidelines, in their national regulatory processes for licensing and ongoing supervision of space activities.[36]

Second, soft law instruments can help States to "socialize" adherence to technical standards and best practices. A number of soft law instruments are bottom-up technically-based instruments drawn from technical standards and best-practice guidelines based on the experiences of States in the safe conduct of space operations. Other States may use these soft law instruments as a basis for enhancing their own national regulatory frameworks and associated administrative procedures. The provisions contained in these soft law instruments may find expression in regulatory frameworks for the licensing and supervision of space activities, or in legally binding contracts. They may also find expression in cooperation agreements among States, thus creating a form of "peer pressure" for compliance that threatens isolation of actors who refuse to comply with such standards and practices. This has the further effect of encouraging States to coordinate with each other during the

[36] *See* INTER-AGENCY SPACE DEBRIS COORDINATION COMMITTEE, IADC SPACE DEBRIS MITIGATION GUIDELINES (Mar. 2020), https://www.iadc-home.org/documents_public/file_down/id/4204 [hereinafter IADC SPACE DEBRIS MITIGATION GUIDELINES].

development of their national regulatory frameworks to avoid regulatory fragmentation across different jurisdictions. As space activities increasingly involve non-State actors from multiple States, addressing custody chain issues can be better solved by State cooperation.[37]

Third, soft law can support interpretation and implementation of existing treaties and obligations. Article 31 of the Vienna Convention on the Law of Treaties refers to "any subsequent practice in the application of the treaty which establishes the agreement of the parties regarding its interpretation."[38] If States Parties to a given treaty also adopt a soft law instrument that pertains to that treaty in some way, and then voluntarily implement its provisions on a consistent basis, this may be considered an expression of subsequent practice in the application of the treaty.

Fourth, through consistent implementation by States, soft law plays a role in contributing to the formation of customary international law. Widely accepted *and implemented* non-binding technical standards, guidelines and other resolutions, such as decisions and recommendations made by the International Telecommunication Union (ITU), that are (i) followed in a common, consistent and concordant manner by a significant number of States, (ii) underpinned by a belief that they are complying with an emerging customary rule and (iii) coupled with an absence of substantial and persistent dissent by other States, may be cited as evidence of general State practice, which is a source of customary international law.

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[37] We recall here two examples of such "chain of custody" issues. The first was the unauthorized launch of multiple unlicensed and untrackable small satellites by Swarm Technologies Inc in January 2018 in defiance of a ruling by the Federal Communications Commission, for which the company was subsequently fined $900,000. David Shepardson, *FCC Fines Swarm $900,000 for Unauthorized Satellite Launch,* REUTERS (Dec. 20, 2018), https://www.reuters.com/article/us-usa-satellite-fine/fcc-fines-swarm-900000-for-unauthorized-satellite-launch-idUSKCN1OJ2WT (last visited Sep. 8, 2020). Another example was the undocumented introduction of microscopic tardigrades onto the Israeli Beresheet lunar mission, which subsequently crashed on the lunar surface in April 2019. Christopher D. Johnson, et. al., *The Curious Case of the Transgressing Tardigrades (Part 1,* (Aug. 26, 2019), https://www.thespacereview.com/article/3783/1 (last visited Sep. 8, 2020). These events point to the need for improved coordination among national regulatory authorities responsible for the authorization and ongoing supervision of space activities.

[38] Vienna Convention on the Law of Treaties art. 31, May 23, 1969, 1155 U.N.T.S. 331 (1969).

With these observations of legal principles, we turn now to a review of soft law initiatives aimed at addressing the challenges to space sustainability, safety and security outlined in Part I.

III. SOME SOFT LAW INITIATIVES IN SPACE SUSTAINABILITY AND SPACE SECURITY AND THEIR OUTCOMES

In addition to the codification of the Space Treaties, progress has also been made in developing a common understanding on other issues related to the exploration and peaceful uses of outer space. All in all, 132 UN General Assembly resolutions or recommendations relating to outer space were adopted from 1958 to 2018. These resolutions have been complemented by additional instruments containing more technically detailed guidance. These instruments include a set of voluntary Space Debris Mitigation Guidelines[39] adopted in 2007 and a Safety Framework for Nuclear Power Source Applications in Outer Space,[40] developed jointly by the Scientific and Technical Subcommittee of COPUOS and the International Atomic Energy Agency, which was adopted in 2009, and a set of twenty-one COPUOS Guidelines for the Long-term Sustainability of Outer Space Activities (LTS Guidelines), adopted in 2019.[41] On the space security front, there have been soft law initiatives carried out under the framework of the UN First Committee to address transparency and confidence building measures in outer space activities and the prevention of an arms race in outer space. In this section, we will discuss several of these multilateral initiatives carried out within and outside of the framework of the UN. We will consider two kinds of soft law initiatives: those that address space sustainability and concerns regarding the space environment, and those that address space security.[42] As multilateral discussions

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[39] IADC SPACE DEBRIS MITIGATION GUIDELINES, *supra* note 36.

[40] Safety Framework for Nuclear Power Source Applications in Outer Space, United Nations Comm. on the Peaceful Uses of Outer Space and the International Atomic Energy Agency, U.N. Doc. A/AC.105/934 (2009), https://fas.org/nuke/space/iaea-space.pdf

[41] Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Sixty-Second Session, at 48-69, U.N. G.A. Doc. A/74/20 (June 12-21, 2019)[hereinafter the LTS Guidelines].

[42] A discussion of soft-law approaches to space resource governance falls outside the scope of this article. Examples of efforts in this area are the Hague Building Blocks for an International Framework on Space Resource Activities. *See* THE HAGUE INTERNATIONAL SPACE RESOURCES GOVERNANCE WORKING GROUP, BUILDING BLOCKS FOR AN INTERNATIONAL FRAMEWORK ON SPACE RESOURCE ACTIVITIES (Nov. 2019),

cannot be divorced from their geopolitical context, it is therefore instructive to consider not just the final outcomes and end products of these initiatives, but also the context and processes of these discussions.

A. Multilateral Initiatives Addressing Space Sustainability and Space Safety

i. UN COPUOS Space Debris Mitigation Guidelines

Historically, the primary sources of space debris in Earth orbit have been mission-related debris released intentionally by launch vehicle orbital stages and spacecraft and debris produced from accidental or intentional break-ups of space objects. The majority of debris in orbit now comes from such break-ups. In the future, fragments generated by collisions are expected to be a significant source of space debris. The international space community has taken steps to promote responsible actions in outer space to minimize the growth of the debris population in orbit through adopting a series of voluntary debris mitigation measures.

Space debris mitigation measures can be divided into two broad categories: those that curtail the generation of potentially harmful space debris in the short term and those that limit their generation over the longer term. The former involves the curtailing of mission-related debris and the avoidance of break-ups. The latter concerns end-of-life disposal procedures to remove decommissioned spacecraft and launch vehicle orbital stages from regions populated by operational spacecraft.

The principal technical sources for debris mitigation guidelines and standards are those produced by the Inter-Agency Debris Coordination Committee (IADC)[43] and the International Organization for Standardization (ISO).[44] These standards were in turn shaped by the experiences of several space agencies. The IADC guidelines were "multilateralized" through UN Committee on the

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[43] *See* IADC SPACE DEBRIS MITIGATION GUIDELINES, *supra* note 36.

[44] *ISO Standard 24113:2019 Space Systems — Space Debris Mitigation Requirements*, Int'l Org. for Standardization, https://www.iso.org/obp/ui/#iso:std:iso:24113:ed-3:v1:en (last visited Nov. 6, 2020).

Peaceful Uses of Outer Space (COPUOS). We will not repeat these guidelines and standards here, but only summarize their salient points. In general, all these space debris mitigation guidelines and standards, such as the COPUOS or IADC guidelines or ISO Standard 24113, apply to any spacecraft, whatever its size. These various sets of guidelines have the following three general elements in common:

1. Passivate sources of energy, such as batteries, momentum wheels, and vent excess propellant;

2. Avoid the creation of debris; this includes avoiding explosions and collisions; and

3. In the case of the IADC guidelines and ISO Standard 24113, but not the COPUOS guidelines, ensure that all objects left on-orbit are re-entered within 25 years after the end of their operational life or moved to an acceptable graveyard orbit.

The adoption of the UN COPUOS Space Debris Mitigation Guidelines[45] was the result of twelve years of work by the Committee and its Scientific and Technical Subcommittee. At its thirty-first session, in 1994, the Subcommittee considered, for the first time, matters associated with space debris under a new item on its agenda.[46] In 1995, the Subcommittee adopted a multi-year workplan for this agenda item from 1996 to 1998 in which it would gather the contributions of States in a report that would be carried forward and updated each year, leading to an accumulation of advice and guidance on the issue of space debris.[47] At its thirty-eighth session, in 2001, the Subcommittee agreed to establish a workplan for 2002 to 2005 with the goal of adopting a set of voluntary debris

[45] U.N. OFFICE FOR OUTER SPACE AFFAIRS, 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 [hereinafter UNOOSA SDM GUIDELINES].

[46] *Id.*

[47] *Id.*; Comm. on the Peaceful Uses of Outer Space, Rep. of the Sci and Tech. Subcomm. on Its Thirty-Second Session, ¶ 83, U.N. Doc. A/AC.105/605 (Feb. 24, 1995).

mitigation measures.[48] In accordance with that workplan, at the fortieth session of the Subcommittee, in 2003, the IADC presented its proposals on debris mitigation.[49] These were based on consensus among the IADC members, all of whom were also UN COPUOS members. At its forty-first session, in 2004, the Subcommittee established a working group to consider comments from member States on the IADC proposals on debris mitigation.[50] During the forty-second session of the Subcommittee, in 2005, the Working Group agreed on a set of considerations for space debris mitigation guidelines and prepared a new workplan for the period from 2005 to 2007.[51] At its fiftieth session, in 2007, the Committee adopted the space debris mitigation guidelines,[52] which were subsequently endorsed by the General Assembly in its resolution 62/217 of 22 December 2007.[53] The General Assembly agreed that the voluntary guidelines for the mitigation of space debris reflected the existing practices as developed by a number of national and international organizations and encouraged States to implement those guidelines through relevant national mechanisms.

A number of States have implemented debris mitigation measures in their national legislation based on these COPUOS guidelines, as well as the IADC guidelines and ISO standards. The UN Office for Outer Space Affairs has published a compendium of space debris mitigation standards adopted by States and international organizations that provides a helpful overview of the different levels of implementation of debris mitigation measures in UN member States with a wide range of space capabilities.[54]

When it comes to end-of-life disposal, a significant difference between the COPUOS debris mitigation guidelines and the IADC

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[48] UNOOSA SDM GUIDELINES *supra* note 45; Comm. on the Peaceful Uses of Outer Space, Rep. of the Sci. and Tech. Subcomm. on Its Thirty-Eighth Session, ¶ 130, UN Doc. A/AC.105/761 (Mar. 2, 2001).

[49] *See* UNOOSA SDM GUIDELINES *supra* note 45.

[50] *See id.*

[51] *Id.* at iv.

[52] *Id.*

[53] G.A. Res. 62/217, International Cooperation in the Peaceful Uses of Outer Space (Feb. 1, 2008).

[54] *See Compendium of Space Debris Mitigation Standards Adopted by States and International Organizations*, U.N. OFF. OUTER SPACE AFF., http://www.unoosa.org/oosa/en/ourwork/topics/space-debris/compendium.html (last visited Nov. 12, 2020).

guidelines exists. The former did not incorporate the so-called "25-year rule" for removing spacecraft from protected orbital regions within 25 years after the end of nominal mission operations.[55] The European Space Agency's Annual Space Environment Report for 2019 notes that a significant fraction of payload mass (40% or more) and rocket body mass (as much as 30%) reaching end-of-life in the current decade in the LEO protected region will not comply with the 25-year rule.[56] One may wonder whether this compliance rate would have been better had the "25-year rule" been incorporated into the COPUOS guidelines in 2007.

It is worth emphasizing that the current international debris mitigation guidelines and standards were developed in the early 2000s, before the era of mega-constellations, and the well-known "25-year rule" was premised on the launch rates in the mid-1990s. The 25-year rule did not anticipate the currently foreseen tenfold increase in the number of satellites over the coming decade. Under such circumstances, a growing number of experts are arguing that the 25-year rule needs to be drastically revised downwards to as few as five years. Some experts have even suggested that post-mission disposal should be thought of on a timescale of months, rather than years.[57]

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[55] The IADC Space Debris Mitigation Guidelines states that "Spacecraft or orbital stages that are terminating their operational phases in orbits that pass through the LEO region, or have the potential to interfere with the LEO region, should be de-orbited (direct re-entry is preferred) or where appropriate maneuvered into an orbit with an expected residual orbital lifetime of 25 years or shorter." IADC SPACE DEBRIS MITIGATION GUIDELINES, *supra* note 36, ¶ 5.3.

[56] *See* ESA SPACE DEBRIS OFF., *supra* note 11, at 87.

[57] There is yet to be consensus on reducing the 25-year rule, let alone on what would be a sensible new duration for post-mission orbital lifetime. The latest update of the United States Orbital Debris Mitigation Standard Practices (ODMSP) upheld the rule. Orbital Debris Mitigation Standard Practices, November 2019 Update, a pdf version can be found at https://orbitaldebris.jsc.nasa.gov/mitigation/; *See* Theresa Hitchins, *US Tightens Space Debris Standards; Keeps 25-Year Cap*, BREAKING DEFENSE (Dec. 9, 2019), https://breakingdefense.com/2019/12/us-tightens-space-debris-standards-keeps-25-year-cap/; Theresa Hitchins, *Most Satellite Operators Fail To Follow Space Debris Rules: NASA*, BREAKING DEFENSE (May 18, 2020), https://breakingdefense.com/2020/05/most-satellite-operators-fail-to-follow-space-debris-rules-nasa/ (discussing the various perspectives related to Orbital Debris Mitigation Standards).

ii. UN COPUOS Guidelines for the Long-Term Sustainability of Outer Space Activities[58]

The UN has addressed the concept of sustainable development on Earth in a number of global summits and fora for the past 40 years. In 2015, the UN General Assembly adopted the Sustainable Development Goals (SDGs), a set of 17 global goals that address the world's most pressing problems.[59] Extending the concept of sustainability to outer space is a more recent development, arising from the realization that the Earth's orbital space environment constitutes a finite resource that is being used by an increasing number of space actors that include States, commercial actors and other non-governmental entities. The proliferation of space debris, the increasing complexity of space operations, the emergence of large constellations of satellites, and the increased risks of collisions and interference with the operation of satellites raise concerns about the safety of space operations and the long-term sustainability of space activities. Addressing these developments and risks requires international cooperation.

Over the years, COPUOS has considered different aspects of the long-term sustainability of outer space activities from various perspectives. Building on those previous efforts and other relevant related efforts, in 2010, COPUOS established a Working Group on the Long-term Sustainability (LTS) of Outer Space Activities under its Scientific and Technical Subcommittee.[60] The Working Group examined the long-term sustainability of space activities within the broader context of sustainable development on Earth; considered current practices, operating procedures, technical standards and policies relevant to space sustainability and safety; and took as its

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[58] The text in the opening of this Part III (A)(ii) and including subsections (a) and (b) of this part is taken verbatim from the Secure World Foundation Fact Sheet on Long-Term Sustainability Guidelines Fact Sheet (Nov. 2019). The fact sheet may be found here: https://swfound.org/media/206891/swf_un_copuos_lts_guidelines_fact_sheet_november-2019-1.pdf (last visited Feb. 6, 2021)[hereinafter SWF Fact Sheet].

[59] *See* G.A. Res. 70/1 (Oct. 21, 2015) (listing 17 Sustainable Development Goals and the associated 169 targets).

[60] Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifty-Third Session, ¶¶ 174-203, U.N. Doc. A/AC.105/958 (Mar. 11, 2010) (referencing the establishment of the working group).

legal framework the existing UN treaties and principles governing space activities.[61]

The Working Group established four expert groups that considered sets of related topics. These expert groups were deliberative fora comprising subject matter experts nominated by COPUOS member States. The experts were mandated to discuss the topics within the remit of their respective groups and to propose candidate guidelines for the consideration of the Working Group. Although the experts were nominated by their States, they functioned in an ad hominem capacity *as experts*, and did not necessarily always reflect the official positions of their States on the topics under discussion. The four expert groups carried out their work from 2011 to 2013 and in 2014 they presented their reports to the Working Group containing proposed candidate guidelines and topics for further consideration by the Working Group.[62]

In addition to the draft guidelines proposed by the expert groups, a number of COPUOS member States also proposed draft guidelines. All these draft guidelines were discussed by the Working Group from 2014 onwards. Because COPUOS reaches decisions by absolute consensus of all its member States, progress was slow. In 2016, at its 59th session, the Committee agreed on the first 12 LTS Guidelines, and extended the Working Group's mandate for another two years, to June 2018. Discussions on a preamble and additional draft guidelines continued in 2017 and 2018. The Working Group concluded its work in June 2018 with agreement on a preamble and a further nine guidelines, bringing to 21 the total number of agreed guidelines. In addition to the 21 agreed LTS

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[61] *See* Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifty-Fourth Session, U.N. Doc. A/66/20 (June 1-10, 2011) [hereinafter 2011 COPUOS Report].

[62] Comm. on the Peaceful Uses of Outer Space, *Working Report of Expert Group B: Space Debris, Space Operations and Tools to Support Collaborative Space Situational Awareness*, Fifty-Seventh Session, U.N. Doc. A/AC.105/C.1/2014/CRP.14 (June 16, 2014); Comm. on the Peaceful Uses of Outer Space, Sci. and Tech. Subcomm., *Working Report of Expert Group C: Space weather*, Fifty-First Session, U.N. Doc. A/AC.105/C.1/2014/CRP.15 (Feb. 5, 2014); Comm. on the Peaceful Uses of Outer Space, Sci. and Tech. Subcomm., *Working Report of Expert Group A: Sustainable Space Utilization Supporting Sustainable Development on Earth*, Fifty-First Session., U.N. Doc. A/AC.105/C.1/2014/CRP.13 (Feb. 3, 2014); Comm. on the Peaceful Uses of Outer Space, Sci. and Tech. Subcomm., *Working Report of Expert Group D: Regulatory Regimes and Guidance for Actors in the Space Arena*, Fifty-First Session, U.N. Doc. A/AC.105/C.1/2014/CRP.16 (Feb. 3, 2014).

Guidelines, the Working Group also held discussions on another seven draft guidelines, but was not able to achieve consensus on those during its mandate. When the Working Group's mandate came to an end in June 2018, with no consensus on the remaining draft guidelines or how to advance the work of LTS in COPUOS, the 61st session of COPUOS ended in a stalemate, with no agreed report of the working group. However, in 2019 delegations returned to the negotiations with renewed vigour and were able to reach agreement on the way forward.

At its 62nd session in June 2019, COPUOS adopted the 21 LTS Guidelines by absolute consensus of its then 92 member States. The LTS Guidelines are prefaced by a politically significant context-setting preamble that includes an agreed definition of space sustainability, which reads as follows:

> The long-term sustainability of outer space activities is defined as the ability to maintain the conduct of space activities indefinitely into the future in a manner that realizes the objectives of equitable access to the benefits of the exploration and use of outer space for peaceful purposes, in order to meet the needs of the present generations while preserving the outer space environment for future generations.[63]

The full text of the preamble and LTS Guidelines is annexed to the report of the 62nd session of COPUOS.[64]

It is worth noting that during the eight years that it took to negotiate these LTS Guidelines, the membership of COPUOS grew from 71 to 92 member States. Given the consensus rule in COPUOS, one could be forgiven for thinking that consensus was an ever-receding target, but in the end, the Committee did reach consensus. To do so, required considerable flexibility and compromise on the part of States. This is reflected in the language of the LTS Guidelines, which is not at all prescriptive, recognizing the wide

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[63] Comm. on the Peaceful Uses of Outer Space, Guidelines for the Long-term Sustainability of Outer Space Activities, Conference Room Paper by the Chair of the Working Group on the Long-term Sustainability of Outer Space Activities, U.N. Doc. A/AC.105/2018/CRP.20 (June 27, 2018).

[64] Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Sixty-Second Session, U.N. Doc. A/74/20 (June 12-21, 2019) (establishment of the Working Group).

variety of ways in which States organize, conduct and regulate their space activities.

a. The LTS Guidelines

The 21 agreed guidelines comprise a collection of internationally recognized measures for ensuring the long-term sustainability of outer space activities and for enhancing the safety of space operations. They address the policy, regulatory, operational, safety, scientific, technical, international cooperation and capacity-building aspects of space activities. They are based on a substantial body of knowledge, as well as the experiences of States, international intergovernmental organizations and relevant national and international non-governmental entities. Therefore, the LTS Guidelines are relevant to both governmental and non-governmental entities. They are also relevant to all space activities, whether planned or ongoing, as practicable, and to all phases of a space mission, including launch, operation and end-of-life disposal.

The purpose of the LTS Guidelines is to assist States and international intergovernmental organizations, both individually and collectively, to mitigate the risks associated with the conduct of outer space activities so that present benefits can be sustained and future opportunities realized. Consequently, the implementation of the LTS Guidelines should promote international cooperation in the peaceful use and exploration of outer space.

The LTS Guidelines are intended to support the development of national and international practices and safety frameworks for conducting outer space activities while allowing for flexibility in adapting such practices and frameworks to specific national circumstances. They are also intended to support States and international intergovernmental organizations in developing their space capabilities in a manner that avoids causing harm to the outer space environment and the safety of space operations.

The LTS Guidelines are voluntary and not legally binding under international law. The existing UN treaties and principles on outer space provide the fundamental legal framework for these guidelines. However, despite their non-binding status under international law, the LTS Guidelines can have a legal character in the sense that States may choose to incorporate elements of the LTS

Guidelines into their national legislation, as has been the case with the UN COPUOS space debris mitigation guidelines.

b. LTS 2.0–Next Steps in COPUOS

While the 21 consensus LTS Guidelines represent a significant step forward to promote space sustainability, COPUOS member States agree that the work of COPUOS on this issue is far from over. Building on the lessons learnt from the LTS discussions, the Committee has initiated a new phase of the LTS discussions in COPUOS – LTS 2.0.

At its 62nd session in June 2019, the Committee noted that it should serve as the principal forum for continued institutionalized dialogue on issues related to the implementation and review of the LTS Guidelines. The Committee also decided to establish a working group with a five-year workplan under its Scientific and Technical Subcommittee to continue the LTS discussions in COPUOS. The Committee decided that this new working group would be guided by the following framework:

> a) Identifying and studying challenges and considering possible new guidelines for the long-term sustainability of outer space activities. This work could also take into consideration draft guidelines that were discussed, but for which consensus could not be reached during the term of the first LTS Working Group.
>
> b) Sharing experiences, practices and lessons learned from voluntary national implementation of the 21 already adopted guidelines.
>
> c) Raising awareness and building capacity, in particular among emerging space nations and developing countries, to implement the guidelines.[65]

Apart from the agreed LTS Guidelines, one of the main benefits of the LTS discussions in COPUOS is that it has raised the

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[65] See Comm. on the Peaceful Uses of Outer Space, Rep. of the Legal Subcomm. on Its Fifty-Sixth Session, U.N. Doc A/AC.105/C.1/L.367 (Feb. 11-22, 2019) for the draft guidelines that did not reach consensus during the mandate of the Working Group. The progress made in the discussions of these draft guidelines will help to inform the direction of future LTS discussions.

general level of awareness in the international community about the importance and urgency of addressing space sustainability as an international issue. Since the start of the LTS discussions in COPUOS in 2010, the membership of the Committee has grown from 70 to 92 States, and the level of engagement of States in the LTS debates has increased significantly. Participation in the LTS process is the latest example of increased interest by UN member States in the work of COPUOS. The current membership of COPUOS represents not only a greater geographical diversity, but also a much greater diversity of space capabilities than was the case previously. This has naturally made it harder to reach consensus in the Committee than would have been the case for a smaller group of States. Nevertheless, regardless of their level of development, or how invested they are in space systems, all the COPUOS member States share a common belief in the importance of ensuring a sustainable future for space activities and recognize that such a future is achievable only though international dialogue and cooperation.

c. Implementation and Updating

When it comes to implementation, the LTS Guidelines are not at all prescriptive, recognizing the wide variety of ways in which States organize, conduct and regulate their space activities. Of course, the LTS Guidelines will only achieve their intended purpose if they are implemented as widely as possible. States and international intergovernmental organizations are encouraged to implement these LTS Guidelines to the greatest extent feasible and practicable, in accordance with their respective needs, conditions and capabilities, and with their existing obligations under applicable international law. Indeed, a number of COPUOS member States have already started referring to their national activities to implement these guidelines. At the February 2020 session of the Scientific and Technical Subcommittee, the United Kingdom presented a paper providing detailed information on their implementation experiences and practices.[66] The UK delegation stated that in so doing, they were hoping that other States would follow their example to

[66] Comm. on the Peaceful Uses of Outer Space, Rep. of the Sci. and Tech. Subcomm. on Its Fifty-Seventh Session, U.N. Doc A/AC.105/C.1/1020/CRP.15 (Feb. 7, 2020).

build a community of practice for implementation of the LTS Guidelines.

International cooperation is required to implement the LTS Guidelines effectively and to monitor their impact and effectiveness. However, COPUOS recognizes that not all space actors have equal capability or capacity to implement these guidelines. Therefore, the LTS Guidelines place strong emphasis on international cooperation and information sharing. States and international intergovernmental organizations with extensive experience in conducting space activities are encouraged to support developing countries to strengthen their national capacities to implement the LTS Guidelines.

COPUOS also recognizes that the LTS Guidelines should be a "living document" that is periodically updated to ensure that, as space activities evolve, the guidelines continue to reflect the most current state of pertinent factors influencing the long-term sustainability of outer space activities. This "living document" aspect of the LTS Guidelines is especially important given that the rapid evolution in space activities makes space sustainability a dynamic, multi-scale problem.

d. Mainstreaming the LTS Guidelines in the Commercial Space Sector - The Role of the Private Sector in Space Sustainability

Although the LTS Guidelines address States and intergovernmental organizations, most of the actors engaged in the conduct of outer space activities are non-State entities. The argument could be made that the LTS Guidelines are aimed at States and that, because they are voluntary and non-binding, this means that non-State actors would not need to follow the LTS Guidelines unless they were codified into national legislation. Due to their growing prominence in the space arena, commercial space actors can play a major role in socializing the issue of space sustainability, demonstrating their adherence to these guidelines as a minimum standard of behaviour, and leading by example. As noted in a fact sheet prepared by the Secure World Foundation:

> Indeed, the private sector is already taking steps to promote responsible behaviours in outer space. In September 2019, the

Space Safety Coalition was established. This industry-led initiative is an ad hoc coalition of companies, organizations and other government and industry stakeholders that actively promotes responsible space activities through the adoption of relevant international standards, guidelines and recommended practices. In particular, the members of the coalition commit themselves to implementing the guidance contained in the coalition's document *Best Practices for the Sustainability of Space Operations* These best practices are orbit-regime-agnostic and are generally applicable to all spacecraft, regardless of their physical size, orbital regime or constellation size, and directly address many aspects of the 21 consensus LTS Guidelines adopted by COPUOS in June 2019. In this regard, the Space Safety Coalition represents an important step in industry commitment to ensuring the sustainability of the space domain.

The private sector is already thinking beyond the scope of the LTS Guidelines to develop standards for commercial close-proximity operations in orbit, something which is not addressed by the 21 already adopted LTS guidelines. The ability to conduct cooperative on-orbit close-proximity operations (such as inspections or on-orbit servicing) will enable the growth of the orbital space economy. However, the lack of clear, widely-accepted technical and safety standards for the responsible performance of such operations involving commercial satellites could lead to mishaps that would put the long-term sustainability of space activities at risk, and this remains a major obstacle to the development of a satellite servicing industry.

The Consortium for Execution of Rendezvous and Servicing Operations (CONFERS) is an industry-led initiative that aims to leverage best practices from government and industry to research, develop and publish non-binding, consensus-derived technical and operations standards for on-orbit servicing and rendezvous and proximity operations. The consortium currently comprises 27 industry members from different countries, with Secure World Foundation providing coordinating and administrative support for this initiative under contract to DARPA. In November 2018, the CONFERS members agreed to Guiding Principles. In February 2019, the Consortium adopted its first Design and Operational Practices to enhance the operational safety and success of rendezvous and close-proximity operations and on-orbit satellite servicing. The Consortium

> also submitted a formal request to Subcommittee 14 of the International Organization for Standardization (ISO) to add a new work item on satellite servicing and begin discussions of an initial draft standard based on the CONFERS principles and practices. And in October 2019, the members published a set of baseline mission phases for on-orbit servicing missions. The development and codification of standards for commercial rendezvous and close-proximity operations and on-orbit satellite servicing could pave the way for UN COPUOS to discuss and adopt best-practice international guidelines on these topics in the future.[67]

Industry associations are also playing a role to promote implementation of the LTS Guidelines and responsible behaviours by their members. In October 2019, the Satellite Industry Association (SIA) adopted a set of Principles of Space Safety for the Commercial Satellite Industry.[68]

To summarize the main point of this section, soft law instruments have been successfully developed in multilateral fora to address problems and challenges commonly encountered by all space actors through bottom-up, technically-based approaches that encapsulate the best practices of space actors with experience in the conduct of space activities. In the next section, we will turn our attention to soft law initiatives that address space security topics.

B. Multilateral Soft Law Initiatives that Address Space Security

Security is both a condition and a belief of being free from or resilient against danger or threat, and is based on perception. It is an uncertain quality; it is relative not absolute, largely subjective and takes many forms (e.g. national security, food security, environmental security, etc.). The term *space security* has traditionally been understood to refer to the security of space systems used for national security and defense. Recently, it has also been used to refer to the economic, societal and environmental dimensions of space activities. When it comes to ensuring the security of space systems, the situation in space is more complicated than on Earth. In the

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[67] SWF Fact Sheet, *supra* note 58, at 5 (citations omitted).

[68] Press Release, SIA, Principles of Space Safety for the Commercial Satellite Industry, (Oct. 22, 2019), https://sia.org/space_safety/.

harsh environment of outer space, it is difficult to verify what is happening to one's own assets, or what is happening to the assets of others and what their intentions are. Misunderstandings, misperceptions and mistrust can undermine the perception of security and lead to miscalculations that could result in military confrontations on the ground or in space. The increasingly congested and contested nature of the space environment and the growing number of countries developing counterspace capabilities highlights the need to seek out ways to prevent military confrontation and to foster regional and global stability.

During the 1960's and 1970's a number of agreements were adopted to prevent the weaponization of outer space. These agreements include the Outer Space Treaty and the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water. Although these treaties banned the placement and testing of weapons of mass destruction in space, they do not prevent States from placing other types of weapons in space.[69] As a result, numerous States argue that existing treaties are insufficient to safeguard space as a domain for exclusively peaceful activities, and they argue that the international community needs to put in place legally binding measures for space arms control.

Over the years, there have been concerted efforts in the UN First Committee and in the Conference on Disarmament (CD) to address the Prevention of an Arms Race in Outer Space (PAROS). The CD began earnest work on PAROS in 1982. Opinions are sharply divided on what may be the most effective way to address the issue. Some States argue the case for legally binding instruments, while others promote non-binding, voluntary instruments. The leading proponents of a form of legally binding space arms control are China and Russia, who have proposed a Draft Treaty on the Prevention of the Placement of Weapons in Space, the Threat or Use of Force Against Space Objects (PPWT) to the Conference on Disarmament.[70] The first draft of this treaty was presented in 2008

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[69] Outer Space Treaty, *supra* note 22, art. IV. Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water, art. I, Aug. 5, 1963, 14 U.S.T. 1313, 480 U.NT.S. 43.

[70] *The Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects (Draft)*, Ministry of Foreign Aff. of China (June 16, 2014),

and was poorly received by the United States and its allies. Some of the main criticisms of the PPWT were that: (i) it did not address the most pressing threats to space objects; (ii) it strategically favored the interests of its co-sponsors; and (iii) it lacked reliable means of verification.[71] In June 2014, Russia and China presented an updated draft treaty which attempted to address the concerns raised on their 2008 version. However, delegations in the CD remarked that, in their view, the new draft retained the most controversial aspects of the 2008 version.[72] Since then, the major space powers and their allies have remained deadlocked on the issue of legally binding space arms control. Furthering the controversy, China and Russia have continued to develop their counterspace capabilities in ways that would not technically violate the PPWT.[73]

The Group of Governmental Experts on further practical measures for the prevention of an arms race in outer space (GGE on PAROS) was established in 2017.[74] The GGE was tasked to "consider and make recommendations on substantial elements of an international legally binding instrument on the prevention of an arms race in outer space, including, inter alia, on the prevention of the placement of weapons in outer space. . . "[75] This GGE, which comprised experts from 25 nations, carried out its work in 2018 and early 2019 under the leadership of Brazil's ambassador to the Conference on Disarmament, Guilherme de Aguiar Patriota.[76]

In accordance with its mandate, the GGE considered recommendations on substantial elements of an international legally binding instrument on the prevention of an arms race in outer space, including on the prevention of the placement of weapons in outer space. Pursuant to this mandate, it discussed:

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https://www.fmprc.gov.cn/mfa_eng/wjb_663304/zzjg_663340/jks_665232/kjfywj_665252/t1165762.shtml

[71] *See* Fabio Tronchetti & Liu Hao, *The 2014 Updated Draft PPWT: Hitting the Spot or Missing the Mark?*, 33 SPACE POL'Y 38, 40-42 (Aug. 2015).

[72] *Id.* at 44.

[73] A detailed critique of the PPWT falls outside the scope of this paper. For more information, *see id.* (discussing the positive contributions of PPWT to the security of space objects).

[74] G.A. Res. 72/250 (Dec. 24, 2017).

[75] *Id.* ¶ 3.

[76] *Group of Governmental Experts on Further Effective Measure for the Prevention of and Arms Race in Outer Space,* UNITED NATIONS OFFICE FOR DISARMAMENT AFFAIRS, https://www.un.org/disarmament/topics/outerspace/paros-gge/ (last visited Feb. 7, 2021).

(a) the international security situation . . . in outer space;
(b) the existing legal regime applicable to the prevention of an arms race in outer space;
(c) the application of the right to self-defence in outer space;
(d) general principles . . .;
(e) general obligations . . .;
(f) definitions;
(g) Monitoring, verification and transparency and confidence-building measures . . .;
(h) international cooperation . . .
(i) final provisions and institutional arrangements.[77]

The sessions of this GGE took place against a backdrop of elevated political rhetoric around the counterspace developments in recent years. The Indian anti-satellite test of March 2019[78] took place during the final session of the GGE, further adding to the grim disarmament climate. The GGE considered several drafts of a substantive report. No consensus was reached on a substantive report, so the GGE's final report was simply a procedural report issued as UN document A/74/77.[79] Although this outcome was disappointing to the proponents of space arms control, the process itself was important in that the GGE held substantive discussions on space arms control.

Meanwhile, mistrust and suspicions about new space weapon systems and military space projects continues to multiply. This is evidenced by the hardening rhetoric expressed by the China, Russia and the United States about the other's space activities.[80] Such fears and suspicions give rise to the classic security dilemma, in which actions taken by a State to increase its own security are

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[77] Group of Governmental Experts on Further Practical Measures for the Prevention of an Arms Race in Outer Space, Annex II, 8-9, U.N. Doc. A/74/77 (Apr. 9, 2019) [hereinafter GGE PAROS Report].

[78] For more information regarding the Indian anti-satellite test, *see, e.g.,* 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

[79] GGE PAROS Report, *supra* note 77.

[80] *See, e.g.,* Bryan Bender and Jacqueline Klimas, *Space War is Coming – and the U.S. is Not Ready,* POLITICO (Apr. 6, 2018), https://www.politico.com/story/2018/04/06/outer-space-war-defense-russia-china-463067.

perceived by other States as aggressive or threatening, producing a vicious spiral of unintended and undesired consequences, even when neither side desires conflict.[81] The inherent dual-use character of space technologies makes the security dilemma more acute in space as it is difficult to distinguish between non-military capabilities and clandestine development and/or deployment of defensive or offensive military capabilities. Hence, technological innovations with military implications by one State may provoke a great sense of insecurity in other States, particularly as they relate to the activities of that State in outer space. This makes it difficult to make meaningful progress on arms control instruments that focus on technologies or attempts to define a space weapon. However, as commercial actors and commercial space activities begin to dominate the space ecosystem, should the prevention of an arms race in outer space continue to be the main focus of space security discussions? While the technological capabilities of space objects are very difficult to discern at a distance, and unannounced intentions can only be surmised, behaviours in space can be observed by all. As more countries acquire space situational awareness capabilities, and more data becomes available in the public domain, it will be harder for space actors to conceal aggressive or irresponsible behaviour in space.

We relate this situation simply to underscore the fact that discussions on legally binding space arms control are deadlocked and to ask the question of whether there are any prospects to move forward with non-binding soft law instruments. For the purposes of this discussion, we will not consider bilateral arrangements, but rather focus on multilateral efforts to develop voluntary, non-binding mechanisms. Among these we can include the instruments that focus on technology safeguards to prevent ballistic missile proliferation, and other initiatives to develop instruments that address behaviors in outer space, such as transparency and confidence-building measures and codes of conduct.

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[81] *See generally* John H. Herz, *Idealist Internationalism and the Security Dilemma*, 2 WORLD POLITICS, 157(Jan. 1950).

i. The Hague Code of Conduct Against Ballistic Missile Proliferation & the Missile Technology Control Regime

There are few examples of non-binding, multilateral codes being used to address significant arms control issues. One such instrument is the 2002 Hague Code of Conduct Against Ballistic Missile Proliferation[82] (the "HCOC"), which was negotiated outside of the UN system, and currently has 143 adhering States.[83] The HCOC aims to restrict the proliferation of only one specific kind of weapon system, namely "Ballistic Missiles capable of carrying weapons of mass destruction."[84] States subscribing to the HCOC commit themselves politically to provide pre-launch notifications on ballistic missile and space-launch vehicle launches and test flights.[85] These States also commit themselves to submit an annual declaration of their country's policies on ballistic missiles and space-launch vehicles.[86] It's worth noting that HCOC does not present States that possess advanced ballistic missile capability with any new arms control constraints; rather it constrains States with aspirations to acquire such capabilities. It is therefore not surprising that numerous countries that challenge missile proliferation remain outside this mechanism.

The HCOC aims to supplement, not supplant, the Missile Technology Control Regime (MTCR), a voluntary export control arrangement among member countries sharing a common interest in controlling missile proliferation.[87] Participating countries voluntarily adhere to common export policy guidelines (the MTCR Guidelines) applied to a list of controlled items (the MTCR Equipment, Software and Technology Annex).[88] The Guidelines and Annex are implemented according to each country's national legislation and

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[82] Letter dated 30 January 2003 from the Permanent Representative of the Netherlands to the United Nations Addressed to the Secretary-General, Enclosure, U.N. Doc. A/57.724 (Feb. 6, 2003) [hereinafter HCOC].

[83] *List of HCOC Subscribing States*, HCOC (Feb. 2020), https://www.hcoc.at/?tab=subscribing_states&page=subscribing_states (Feb. 2020). For additional information about the Hague Code of Conduct, see HCOC, https://www.hcoc.at (last visited Nov. 12, 2020).

[84] HCOC, *supra* note 82, at 4, ¶ 3(b).

[85] *Id.,* at 5, ¶ 4(a)(ii).

[86] *Id.,* at 5, ¶ 4(a)(i).

[87] MISSILE TECHNOLOGY CONTROL REGIME ANNEX HANDBOOK 2017 ii (2017)

[88] *Id.*

regulations. The MTCR regime implements missile controls in two categories: Category I items are complete rocket systems (including ballistic missile systems, space launch vehicles and sounding rockets) and uncrewed air vehicles (including cruise missile systems, target drones and reconnaissance drones) capable of delivering at least a 500 kg payload to a range of at least 300 km, the major subsystems that could be used on these systems and their production facilities.[89] Category II items are other less sensitive and dual-use missile-related components that could be used to develop a Category I system, and complete missiles and major subsystems of missiles capable of delivering a payload of any size to a range of 300 km.[90] The MTCR and other instruments that focus on certain technologies face challenges inherent in such an approach, namely reconciling the advances in technology (e.g. 3-D printing) with the new dual-use possibilities of such developments.

Critics of soft law instruments point to the HCOC as an example of the limited value of so-called "norms" in a non-legally binding documents in which there is no consequence for weak adherence and hence the inability of non-binding instruments to successfully address security matters.[91]

ii. Development Transparency and Confidence-Building Measures in Outer Space Activities

One of the ways to address the underlying sources of misperceptions and mistrust that complicate the discussion of legally binding space arms control is to seek to identify transparency and confidence-building measures that States could voluntarily adopt to clarify their intent and behaviors. In 2011, UN Secretary General Ban Ki-moon convened a Group of Governmental Experts on Transparency and Confidence-building Measures in Outer Space Activities[92] (GGE on TCBMs in Space) under the UN General Assembly's First Committee, which handles security and disarmament issues.

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[89] *See id.,* at Annex.

[90] *See id.*

[91] *See generally* Jack Beard, *Soft Law's Failure on the Horizon: The International Code of Conduct for Outer Space Activities*, 38 Univ. Pa. J. Int'l L. 335 (2017)

[92] *See* G.A. Res. 65/68 (Dec. 8, 2010); Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities, 9 ¶ 1, U.N. Doc. A/68/189 (July 29, 2013) [hereinafter GGE on TCBM Report].

The objectives for the GGE on TCBMs in Space were to improve international cooperation and reduce the risks of "misunderstandings, mistrust and miscalculations with regard to the activities and intentions of States in outer space."[93] Many States saw this GGE as a pragmatic way to move the international dialogue on space security issues forward as the Conference on Disarmament, which would be the appropriate forum for such discussions, has been deadlocked and unable to hold substantive discussions for many years and discussions of such matters fall outside the scope of COPUOS.[94]

The GGE on TCBMs in Space comprised 15 international experts nominated by UN Member States.[95] The permanent members of the UN Security Council (China, France, Russia, the United Kingdom and the United States) were represented. The remaining countries were selected by the UN based on State applications and on achieving balanced geographical representation.[96] They were: Brazil, Chile, Italy, Kazakhstan, Nigeria, Romania, South Africa, South Korea, Sri Lanka and Ukraine.[97] The GGE was chaired by Mr. Victor Vasiliev of the Russian Federation. While the GGE experts were nominated by their States, they were expected to provide politically neutral expertise to the process. The GGE met for the first time in New York on July 23-25, 2012, for a second time in Geneva on April 1-5, 2013, and for a final time in New York on July 8-12, 2013.[98]

In developing its report, the GGE examined existing international law regarding space (hard law as well as soft law instruments), along with Member State submissions to the Secretary General on existing space TCBMs.[99] It also considered the proposed draft International Code of Conduct for Outer Space Activities (see Part III.b.iii below), the work of the COPUOS Working Group on the LTS Guidelines and existing bilateral and multilateral TCBMs.

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[93] *Id.,* at 2.

[94] Secure World Foundation, Fact Sheet on the UN Group of Governmental Experts on Space TCBMs, 1 (Apr. 2014) https://swfound.org/media/109311/swf_gge_on_space_tcbms_fact_sheet_april_2014.pdf [hereinafter SWF GGE Fact Sheet].

[95] GGE on TCBM Report, *supra* note 92, at 5-7.

[96] SWF GGE Fact Sheet, *supra* note 94, at 1.

[97] GGE on TCBM Report, *supra* note 92, at 5-7.

[98] *See* SWF GGE Fact Sheet, *supra* note 94, at 1.

[99] *See* GGE on TCBM Report, *supra* note 92 at 7.

The GGE also consulted with COPUOS, the UN Conference on Disarmament, the International Telecommunication Union and the World Meteorological Organization.[100]

The GGE agreed to a set of TCBMs in outer space activities for implementation by States and international organizations on a voluntary basis.[101] Those measures included: information exchange on space policies; information exchange and notifications related to outer space activities; risk reduction notifications; contact and visits to space launch sites and facilities; international cooperation; consultative mechanisms; outreach; and coordination.[102] The GGE also endorsed efforts to pursue political commitments, for example, in the form of unilateral declarations, bilateral commitments or a multilateral code of conduct, to encourage responsible actions in, and the peaceful use of, outer space.[103]

The GGE achieved a consensus report, which was submitted to the 1st Committee of the UN General Assembly. The report was adopted as Resolution 68/50 by a unanimous vote in the 1st Committee in November 2013,[104] and by the UN General Assembly in December 2013.[105] This resolution welcoming the GGE report and endorsing its content was co-sponsored by China, Russia and the United States[106] and represented a diplomatic breakthrough since the United States had never before voted in favour of the annual TCBMs Resolution.

It is instructive to note that, though this was a First Committee process, it was not carried out in a vacuum from processes in the Fourth Committee, in particular the LTS process discussed above. This is particularly important with regard to the implementation of the recommendations of this GGE. The GGE report refers, in paragraph 39, to "[e]xchanges of information on the basic orbital parameters of outer space objects . . . [and] potential orbital

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100 *Id.,* at 9-12, ¶¶ 4-19.

101 *Id.,* at 13, ¶ 24.

102 *Id.,* at 15-21, ¶¶ 36-67.

103 *Id.,* at 21, ¶ 69.

104 *See* https://gafc-vote.un.org/UNODA/vote.nsf/511260f3bf6ae9c005256705006e0a5b/c6879f983593c99585257c5800698afc?OpenDocument&ExpandSection=2%2C1%2C5#_Section2

105 G.A. Res. 68/50 (Dec. 5, 2013).

106 *See* https://gafc-vote.un.org/UNODA/vote.nsf/511260f3bf6ae9c005256705006e0a5b/c6879f983593c99585257c5800698afc?OpenDocument&ExpandSection=2%2C1%2C5#_Section2

conjunctions."[107] Reference is also made to the registration of space objects.[108] The LTS Guidelines concerning the exchange of contact information, exchange of data on space objects and risk assessments relating to space objects address such matters.[109] The GGE report refers in paragraph 40 to exchanges of information on forecast natural hazards in outer space.[110] The LTS Guidelines on sharing of operational space weather data, forecasts and best practices address this issue.[111] Paragraph 42 of the GGE report refers to notifications relating to "scheduled maneuvers that may result in risk to the fight safety of space objects of other States."[112] The LTS guidelines for safety of space operations address such matters.[113] The GGE report refers in Section V to international cooperation, and touches, inter alia, on international cooperation for capacity building and confidence building.[114] The LTS guidelines on international cooperation in support of long-term sustainability and capacity building address such issues.[115] In other words, a number of the LTS guidelines provide the bottom-up guidance to implement several of the GGE recommendations. This shows that these soft-law instruments developed in two separate UN processes are mutually supportive.

iii. The EU proposal for an International Code of Conduct for Outer Space Activities

More or less at the same time as the multilateral discussions in COPUOS on the long-term sustainability of outer space activities started, the European Union began a political initiative to develop a Code of Conduct for Outer Space Activities.[116] The Code was meant to be a political instrument covering both civilian and

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[107] GGE on TCBM Report, *supra* note 92 at 16, ¶ 39(a).

[108] *Id.,* at 16, ¶ 39(b).

[109] Guidelines A.5, B.1, B.2 LTS Guidelines, *supra* note 41, at 57-60.

[110] GGE on TCBM Report, *supra* note 92 at 17, ¶ 40.

[111] Guideline B.6, LTS Guidelines, *supra* note 41, at 62-3.

[112] GGE on TCBM Report, *supra* note 92 at 17, ¶ 42.

[113] Guidelines B.1 and B.2, LTS Guidelines, *supra* note 41, at 59-60.

[114] GGE on TCBM Report, *supra* note 92 at 18, ¶¶ 49-56.

[115] Guideline C.3, LTS Guidelines, *supra* note 41, at 67.

[116] European Union External Action Service, Draft international Code of Conduct for Outer Space Activities (Mar. 31, 2014), http://www.eeas.europa.eu/archives/docs/non-proliferation-and-disarmament/pdf/space_code_conduct_draft_vers_31-march-2014_en.pdf.

military space activities. This initiative was pursued outside of the existing multilateral fora, partly because of its dual civilian/military focus, but also motivated at least in part as a means to bypass the stalemate on the PAROS issue in the CD and the difficulties posed by the consensus rule in COPUOS and the CD.[117] The EU expressed its intent to open the Code for signature at an international diplomatic conference, to be convened for this purpose.[118]

The draft Code received a mixed response from the international community. Outside of Europe, no other major space powers openly endorsed the initiative. Several States questioned whether the draft Code was an appropriate mechanism to address the military aspects of outer space.[119] Others questioned the legitimacy of these discussions outside of a recognized multilateral forum.[120] Russia and China refrained from supporting the Code, referring instead to their own proposed legally-binding international Draft Treaty on the Prevention on the Placement of Weapons in Outer Space (the PPWT).[121] In January 2012, US Secretary of State Hillary Clinton announced that "the United States has decided to join with the European Union and other nations to develop an International Code of Conduct for Outer Space Activities."[122] Australia's Foreign Minister, Kevin Rudd, soon followed with a similar statement.[123] However, the initiative was not embraced by a significant number of non-EU space-capable States (notably the BRICS

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[117] *See generally* Sergio Marchisio, The Draft Code of Conduct for Outer Space Activities, Brief for the United Nations /Thailand Workshop on Space Law (Nov. 16-19 2010).

[118] *Id.* at 2.

[119] *See* Rajeswari Pillai Rajagopalan, *Keep Space Code of Conduct Moving Forward,* SPACENEWS, (July 21, 2015); Secure World Foundation, Draft International Code of Conduct for Outer Space Activities Fact Sheet (Feb. 2104), https://swfound.org/media/166384/swf_draft_international_code_of_conduct_for_outer_space_activities_fact_sheet_february_2014.pdf

[120] *Id.*

[121] *See, e.g.,* Staff Research Report, *China's Position on a Code of Conduct in Space,* U.S.-CHINA ECON. & SEC. REV. COMM'N, 2 (Sep. 8, 2017).

[122] Press Release, Hillary Rodham Clinton, Secretary of State, Clinton Statement on the International Code of Conduct for Outer Space Activities (Jan. 17, 2012) https://2009-2017.state.gov/secretary/20092013clinton/rm/2012/01/180969.htm. See also Jack Beard, *Soft Law's Failure on the Horizon: The International Code of Conduct for Outer Space Activities*, 38:2 Univ. Pa. J. Int'l.L. 335-424, (2017) for a more detailed overview of the situation regarding the United States' peripheral involvement in the Code of Conduct discussions.

[123] Brett Biddington, Space Code of Conduct: An Australian Perspective – Analysis, EURASIA REVIEW (July 25, 2012).

countries), largely because of concerns about the process and the intent of the EU in keeping this initiative out of established multilateral fora.[124] This meant that the Code of Conduct initiative had no formal multilateral mandate, unlike the GGE on space TCBMs and the COPUOS LTS processes. This lack of a formal multilateral mandate ultimately led to the demise of the Code of Conduct initiative, on procedural grounds, at a special meeting held at the UN in New York in July 2015.[125]

The failure of the late attempt by the EU to "multilateralize" the code through this special UN meeting had a positive ripple effect on the LTS discussions in COPUOS. From the start of the LTS discussions in COPUOS, a number of delegations had questioned how the long-term sustainability work related to the EU's efforts to promote a Code of Conduct, and whether such a Code of Conduct would in some way "trump" the long-term sustainability discussions in COPUOS. This had caused a number of delegations to hold back from full engagement in the LTS discussions, waiting to see how the Code discussions were going to play out. With the demise of the Code discussions in 2015, COPUOS became the only forum holding productive multilateral space sustainability discussions.

It is worth noting that, although some observers saw the Code of Conduct and LTS discussions as competing processes, a closer examination would show that, although the underlying goals were the same, their approaches were diametrically opposed. The COPUOS LTS work was a technically-based, bottom-up approach of developing guidelines based on the collected best practices of established space actors. The Code of Conduct initiative was a more political, top-down approach. The two approaches could, in fact, have complemented each other if the 2015 efforts to "multilateralize" the Code of Conduct had succeeded.

Since July 2015, the EU has not actively promoted the Code of Conduct, but it has not given up on the idea either. In several statements delivered in multilateral fora in the past two years, the EU has expressed the view that it still believes there would be value in

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[124] Rajagopalan, *supra* note 119.

[125] Lucia Marta, *Code of Conduct on Space Activities: Unsolved Critiques and the Question of its Identity,* FRS (Dec. 17, 2015), https://www.frstrategie.org/en/publications/notes/code-conduct-space-activities-unsolved-critiques-and-question-its-identity-2015.

agreeing on an instrument that encourages States to make a voluntary political commitment not to undertake activities detrimental to the safety, security and sustainability of outer space activities. Such a voluntary instrument, potentially to be negotiated within the framework of the UN, should, in the EU's view, not duplicate the work of COPUOS as the UN's mandated norm-creating body for the peaceful uses of outer space and should respect its role in the further development of the legal regime governing space activities. The EU further envisaged that such an instrument would build upon the COPUOS LTS guidelines and would be complementary to these guidelines. As of this writing (August 2020), it is not yet clear whether or how the EU intends to translate these ideas into diplomatic initiatives.[126]

IV. CONCLUSION

We have discussed a number of recent soft-law initiatives in space sustainability and space security. In this section we will summarize the lessons learnt from the various soft law initiatives described in this article and consider how to apply these lessons going forward.

Firstly, although soft-law instruments are legally non-binding, they can be politically binding. By this we mean that non-observance of such a commitment, especially in a democracy, could entail domestic political consequences for the government, reputational damage, international condemnation, or other forms of backlash, such as lost opportunities for cooperation. Moreover, *non-binding* does not *mean non-legal*, in the sense that States can choose to domesticate their politically binding agreement to such voluntary frameworks in their domestic regulatory practices. This is the case with the space debris mitigation guidelines, the LTS Guidelines and export control regimes, such as MTCR.

Secondly, soft law initiatives based on bottom-up, non-binding best practices that approach topics from an applied technical perspective that focuses on solving problems faced by those working

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[126] *See SOS SOS SOS: EU Calls for Ethical Conduct in Space to Avoid Collision and Orbital Debris,* E.U. External Action Serv. (Sept. 19, 2019), https://eeas.europa.eu/headquarters/headquarters-Homepage/67538/sos-sos-sos-eu-calls-ethical-conduct-space-avoid-collision-and-orbital-debris_et for Dr. Carine Claeys announcement of the 3SOS initiative aimed at encouraging safety, security and sustainably of outer space activities.

and operating in the space environment (e.g. space debris, spaceflight safety, regulations) are more likely to yield consensus results in multilateral fora than top-down diplomatic approaches to address more politically sensitive topics, like arms control. This is because the bottom-up approach allows specific technical issues to be addressed by experts from industrial, non-governmental organizations and the specialized governmental agencies of the interested parties who are best qualified to address the specifics of the subject matter. The most recent example of a successful bottom-up process is the LTS Guidelines. The first stage of the LTS process was an expert group phase in which experts discussed and proposed candidate guidelines for negotiation by the UN Working Group mandated to develop these guidelines. The expert groups were deliberative, non-negotiating fora, and had no decision-making powers. Those were reserved for the States participating in the Working Group, which could, and did in some cases, veto consensus recommendations of the expert groups in which their own national experts had participated. Nonetheless, it is telling that the first batch of 12 of the 21 LTS Guidelines adopted in 2016 were based closely on recommendations from the expert group discussions.

In order to maintain the effectiveness of such a bottom-up approach, governments should allow subject matter experts to engage in the discussions and not attempt to take diplomatic or political control of them at a very early stage. This was one of the most valuable lessons of the LTS process and, I believe, one of the principal reasons for the successful outcome of the LTS deliberations in COPUOS. It probably also contributed in no small measure to the successful consensus outcome of the GGE on space TCBMs, where most of the members of the GGE were space experts. There has been a tendency of late to populate GGEs with diplomats or high-level political appointees, and this may undermine the effectiveness of the GGE mechanism in future if politics begins to overshadow the practical substance of the discussions in these GGEs.

The third lesson learnt from these soft-law initiatives is that, even if they are non-binding, soft law instruments really need to be developed with a broad international mandate *ab initio* if they are not to face legitimacy challenges later on. This broad support takes patience and time to build. This was observed in COPUOS, where it took several years to socialize the idea among States that there

was a need for the Committee to address space sustainability with a view to adopting international guidelines. When the idea of space sustainability guidelines was first floated in COPUOS, a number of non-spacefaring States were suspicious of the motive behind this initiative, coming at a time when commercial off-the-shelf components and easier, cheaper access to space were lowering the financial and technological barriers to entry into the space club. Those States were concerned that LTS was simply a ploy by the established space actors to maintain their lead in the space domain by raising entry barriers for emerging space nations. Other non-spacefaring States did not see space sustainability as their problem but rather a concern of the leading space nations who had created all the debris they were claiming to be concerned about. It took several years of efforts (initially led by the French delegation) to socialize the issue in COPUOS to the point where the Committee could agree to add LTS to its agenda. A counter-example to this bottom-up approach was the top-down approach adopted by the European Union with the Code of Conduct initiative, where non-EU States were presented with a complete draft of a Code of Conduct to consider. Many countries did not feel ready to engage substantively in the negotiations of a Code, and others questioned the legitimacy of an effort to create an international instrument outside of established multilateral fora for discussing space issues.

Fourth, soft law approaches should not be used for situations where deliberate verification mechanisms are required. This includes anything to do with arms control. While soft law may lay the foundation for the development of hard law regimes in other fields, in the context of arms control it may instead generate new sources of uncertainty, misperceptions and mistrust.

Soft law instruments negotiated in multilateral fora operating under the consensus rule will inevitably rely on the flexibility of States to arrive at a consensus text that is acceptable to all States. Because of their non-binding nature, there is a conscious effort to avoid the kind of obligatory language found in legally binding documents and this contributes to the ambiguity and imprecision sometimes found in soft law instruments. This ambiguity and imprecision leaves open the possibility for States to interpret those instruments unilaterally and in a self-serving manner whereby they can claim to be adhering to the provisions of an instrument

while their rivals see them as gaining a strategic advantage by cheating.

Unlike space safety or space sustainability, where actors have common concerns, and cheating confers no long-term strategic advantage, arms control happens in a rivalrous context, where mistrust is never far beneath the surface. The absence of obligatory compliance verification mechanisms in voluntary instruments undermines the "trust but verify" logic of legally binding arms control regimes with their robust built-in verification mechanisms. This inherent limitation of soft law instruments was one of the concerns consistently raised by opponents of the EU's Code of Conduct initiative. Not surprisingly, the most contentious aspects of the Code were those that attempted to address space security.

Further, imprecision and ambiguity can lead to different interpretations of provisions in a given soft law instrument by different States, and there is no agreed method for resolving such differences of interpretation. The Vienna Convention on the Law of Treaties provides a comprehensive framework of rules for the observance, application and interpretation of legally binding agreements, including rules for determining the meaning of language which remains ambiguous after the application of other provisions specifying the context and subsequent practice of the parties to a treaty. No such rules exist under international law for resolving disputes regarding the interpretation of ambiguous language in soft law instruments.

In other words, when it comes to arms control, the sorts of "creative ambiguity" often encountered in soft law agreements that allows flexibility in the interpretation and implementation of these instruments, can be a source of mistrust and instability that makes them worse than having no agreements at all.

To conclude, let us consider how the above observations may be applied to the future development of soft law to deal with space sustainability and space security. We will consider each of these facets in turn, starting with space sustainability.

The existing soft law instruments for space sustainability enjoy broad political support and a growing number of States are codifying their political commitments to these instruments in their national regulatory frameworks and authorization and supervision processes. The challenge for the international community is how to

promote adherence to these instruments by the widest possible number of States. This raises the question of capacity building for implementation of the guidance contained within soft law instruments, particularly in countries that are new entrants in the space arena. Emerging space nations will need support from nations with more experience in the conduct and governance of space activities to build their national capacity to implement these soft-law mechanisms effectively.

What about the space security side of the equation? We have seen that soft law is not appropriate to deal with space arms control issues, but space security encompasses more than just space arms control and the prevention of an arms race in outer space. Indeed, the rapid increase in the number of satellites, the number of actors, and the new kinds of space activities, poses as much a threat (if not more) to space security than the development of counterspace capabilities, which have been the focus of space security dialogues to date.

We have witnessed the emergence of behaviours in space that can be seen as either irresponsible (e.g., debris-generating kinetic ASAT tests) or aggressive (e.g., stalking of satellites in LEO and GEO). These activities are happening in a normative environment where such behaviours are neither explicitly permitted nor prohibited. In the absence of clear rules for acceptable behaviour regarding close approaches, or a ban on debris-producing kinetic ASAT tests, it is up to each State to decide what it considers to be responsible behaviour. The fact that other States (and increasingly non-State space actors) are calling out these actions as irresponsible clearly shows that there is no common standard of responsible behaviour. It also shows that States are willing to be vocal about these unfriendly-but-not-illegal acts, when such acts are against their interests. This is where soft law instruments have a role to play. There is much that can be done in the area of developing TCBMs and norms of responsible behaviour that can be addressed through soft law instruments, particularly those that are developed in a bottom-up manner by technical experts.

As the volume of commercial activities in space grows, the commercial actors will become increasingly invested in the subject of space security writ large, and increasingly vocal about the potential negative consequences of conflict in space. In other words, space

security (like space activities in general) is no longer the exclusive preserve of States. With the growth in the number of sensors and sources of space situational awareness (SSA) data, and the advent of non-governmental suppliers of SSA information, it is becoming easier for non-State actors to detect and "call out" bad behaviour. This provides a sort of open source "verification mechanism" that is outside of these soft law instruments, but potentially just as effective. In other words, soft law instruments can be used where there is no need for deliberate verification because actions and behaviours are plainly visible for all to see. Likewise, the same capabilities will allow actors to demonstrate openly their adherence to soft law norms on issues such as post-mission disposal.

Soft law can also be more responsive to developments in technology than legally binding instruments. For example, when the 25-year rule was originally developed in the mid-1990s, it was, *at that time,* a reasonable compromise between a burden on the space environment and a burden on spacecraft designers and operators. Now, thirty years later, we have a vastly more congested and contested space environment, but the technology has also dramatically improved. It is no longer unduly burdensome on operators to require a shorter post-mission disposal time.

Soft law instruments can help to socialize emerging norms of behaviour that eventually become a foundation for the development of hard law regimes. There are a number of areas where norms of responsible behaviour can be developed and this is already happening in the commercial sector. The challenge will be to find ways to socialize these norms and for governments to work with the private sector to incentivize adherence to norms of responsible behaviour while also addressing the "free rider" problem. This is the case where some actors rely on other more invested actors to carry the burdens of safety and sustainability, which can pose a cost disincentive to commercial actors to do everything they can to promote space sustainability from a technical and operational perspective.[127]

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[127] For example, space actors using the "free rider" logic might reason that it is not worth their while to invest in collision avoidance capability to avoid colliding with other operational satellites because the operators of those other satellites with such capabilities would move out of their way to avoid a collision.

Just as it has since the beginning of the Space Age, soft law will continue to play a role in the pragmatic development of national and international regulatory frameworks for space activities. This includes addressing the dimensions of space sustainability and space security, as long as we recognise the limitations of soft law and work within those limitations.

EPILOGUE

As this is a special volume dedicated to the memory and work of Bin Cheng, we should give him the last word. In his seminal work, *Studies in International Space Law,* Bin Cheng had the following to say about non-binding instruments in the evolution of space law:

> Notwithstanding possible internal constitutional difficulties and the usual dilatoriness of States in ratifying agreements, it seems that in the long run the conventional procedure of making international law by treaties will still prove the most straightforward and direct method, and certainly the one most free from eventual controversies and difficulties. It is indeed much to be hoped that the present 'maximum area of agreement that is possible' on the future legal regime of outer space as represented by resolutions 1721A and 1962 will be speedily transformed into legal obligations binding on the maximum number of States.[128]

This passage was published 23 years ago, in 1997, long before the phenomenal growth in the number of space actors and space activities that we are noticing today. The context of his remark was the fact that UN General Assembly resolutions are not, in and of themselves, sources of international law, nor are they legally binding on States. However, space activities, along with human activities in other fields, are ordered not only by legal rules and principles, but also by legally non-binding instruments, whether or not we call them "soft law." In many cases those instruments, be they guidelines, principles, standards, etc., deal with specific, often technical, matters – but this does not diminish their significance for space regulation. Certainly, international space law is not a frozen

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[128] CHENG, *supra* note 20, at 149.

system of binding obligations defined once and for all. It is a living organism that should adequately reflect the evolution of the international space area. Indeed, the development of soft law instruments, often arising as a pragmatic response to pressing problems and challenges shared by many nations, facilitates international cooperation and acts as a bridge between the formalities of treaty-making and the exigencies of international life by legitimizing certain behaviors and creating stability. Will we see these soft law instruments transformed into legally binding obligations to ensure space sustainability and space security as Bin Cheng would have liked? Or will they remain in soft law form? Time will tell.

THE PRIVATIZATION OF CHINESE SPACE ACTIVITIES: A LEGAL AND REGULATORY PERSPECTIVE

Fabio Tronchetti[*]

I. INTRODUCTION

One of the most exciting developments in the field of space law has been the ongoing process of privatization of Chinese space activities. In a sector previously under the exclusive control of State-Owned Enterprises (SOE) and their subsidiaries, over the last six years, private entities have begun playing an increasingly important role in manufacturing, launching and operating satellites. One of the highlights of this process took place in July 2019 when, for the first time ever, a Chinese private launch provider, iSpace, achieved orbit with its Hyperbola-1 launch vehicle.[1] This process of privatization has been influenced by factors like the entrepreneurial nature of Chinese investors and the lower cost to access space; however, it has also benefited from the support of the Central Government. This support has taken the form of various policies and administrative measures, such as the strategy of civil/military integration and the release of documents like "State Council Document 60" on "Guiding Opinions of the State Council on Innovating the Investment and Financing Mechanisms in Key Areas and Encouraging Social Investment," which, for the first time, opened up the space sector to private investments.[2]

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[1] *See* Andrew Jones, *Chinese iSpace Achieves Orbit with Historic Private Sector Launch*, SPACE NEWS (July 25, 2019), https://spacenews.com/chinese-ispace-achieves-orbit-with-historic-private-sector-launch/.

[2] 国务院关于创新重点领域投融资机制鼓励社会投资的指导意见60号 (Guowuyuan Guanyu Chuangxin Zhongdian Lingyu Tourongzi Jizhi Guli Shehui Touzi De Zhidao Yijian), *Guiding Opinions of the State Council on Innovation of Investment and Financing Mechanisms in Key Fields to Encourage Social Investment,* State Council of the People's

Despite the quick progress made by (some) private companies and the interest that this has generated in China and abroad,[3] one should not underestimate the fact that the privatization of Chinese space activities is still at its embryonic stage. There are several factors capable of negatively affecting its long-term success, including the inexperience of several private space players, a fragmented and often burdensome regulatory framework and an overly competitive domestic (and international) business environment.

In light of this exciting, yet complex, background, the purpose of this paper is twofold: first, to describe the process of privatization of Chinese space activities and the factors that have influenced its growth; second, to analyze the regulatory framework applicable to it by pointing out both its positive features and shortcomings, as well as by envisioning future steps that could consolidate the role of private space entities. The analysis will pay particular attention to the area of launching, as this sector has witnessed the emergence of various new—and ambitious—players and has received strong regulatory support from the government. However, reference will also be made to other sectors that have experienced notable growth, such as that of manufacturing and operation of nano-satellites.

II. PRIVATE SPACE ACTIVITIES IN CHINA

In the past six years, Chinese companies have grown at an unprecedented rate, which has placed them in the position to play an increasingly meaningful role in Chinese space activities. While it is undeniable that SOE, and *in primis* the China Aerospace Science and Technology Corporation (CASC)[4] and the China Aerospace

Republic of China, Doc. 60, Nov. 16, 2014, https://www.pku-law.com/en_law/ff6edea03b103284bdfb.html.

[3] One of the most recent and comprehensive analysis of the process of privatization of Chinese space activities is provided by Irina Liu and her co-authors for the Institute of Defense Analysis. *See generally* IRINA LIU ET AL., EVALUATION OF CHINA'S COMMERCIAL SPACE SECTOR (Institute for Defense Analyses, Sept. 2019), https://www.ida.org/research-and-publications/publications/all/e/ev/evaluation-of-chinas-commercial-space-sector.

[4] The China Aerospace Science and Technology Corporation (CASC) is a large SOE that operates through over 130 companies and industrial plants distributed across China. CASC is the main contractor of the Chinese space program and is primarily engaged in the research, design, manufacture and supply of space technologies and systems, as well as in the provision of international commercial space launch services. *See*

Science and Industry Corporation (CASIC)[5] maintain a dominant position, and that the relevance of private Chinese space entities is not comparable to that of their western counterparts, the advancement of the Chinese private sector is undeniable. This is evident when the following three elements are considered: first, the financial support that the private sector has received; second, the rapid advancement of the Chinese private space industry; and third, the diversity of services that private companies are willing to provide.

As to the first point, since 2014 Chinese companies have raised an amount close to US$2 billion (more than RMB 13 billion), including US$1 billion (around RMB 6.7 billion) in private funding and nearly an equal investment from government sources. As to the second aspect, in the past six years more than 100 commercial space companies have been established in China.[6] Though several of these companies have yet to move beyond the research and development phase, their large number shows how promising private endeavors view the space sector. As to the final point, private enterprises have been engaging in all sorts of space activities, from the most complex, such as launching, to the less technologically challenging, such as manufacturing small satellites. Importantly, from the manufacturing side, 2020 has seen the launch of the first satellite of the Galaxy Space Constellation, an initiative led by the company Galaxy Space that intends to provide 5G and Internet of Things services through a constellation of hundreds of satellites.[7] Also, other satellite manufacturers like Commsat and LaserFleet have made significant progress by successfully completing rounds

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China Aerospace Science and Technology Corporation (CASC), FED'N AM. SCIENTISTS (updated Apr. 18, 2007), https://fas.org/nuke/guide/china/contractor/casc.htm.

[5] CASIC is a State-owned, strategic, high-tech enterprise, that consists of more than 140 companies, industries and R&D centers distributed nationwide. CASIC is the main contractor of China's aerospace defense program with a particular focus on the production of short- and medium range ballistic missiles and cruise missiles. CASIC also plays an active part in many space endeavors both manufacturing various components parts and technically supporting ongoing missions. *See Introduction of CASIC*, CHINA AEROSPACE SCI. & INDUSTRY CORP. LTD., http://www.casic.com/n189298/n189314/index.html (last visited Nov. 20, 2020).

[6] *See* Blaine Curcio, *2020: A Turning Point for Chinese Commercial Space*, VIA SATELLITE (Sept. 2020), http://interactive.satellitetoday.com/via/september-2020/2020-a-turning-point-for-chinese-commercial-space/.

[7] Andrew Jones, *China Launches Yinhe-1 Commercial Low Earth Orbit 5G Satellite*, SPACENEWS (Jan. 16, 2020), https://spacenews.com/china-launches-yinhe-1-commercial-low-earth-orbit-5g-satellite/.

of funding.[8] Another sector that has experienced growth in 2020 is that of downstream applications, in particular satellite internet applications. This growth has been fueled by the National Development and Reform Commission (NDRC) announcement of the addition of satellite internet to its list of new infrastructures.[9]

The sector that has received the most attention, also in connection with parallel developments in the United States, is that of launching.[10] In the past few years, more than ten companies, *inter alia* LinkSpace, OneSpace, iSpace, LandSpace and ExPace, have been established with the ultimate goal of providing launching services to domestic and, possibly also, foreign customers.[11] Importantly, so far, resources have been exclusively dedicated to achieving the capability to launch small satellites in LEO, with the launch of larger satellites to higher orbits going beyond the announced objectives of these companies.

Among the launch providers, Expace is certainly the most visible, having completed several launches of its Kuaizhou-1A rocket and delivered in orbit various satellites for multiple Chinese clients.[12] Notably, the success of the Expace has been largely due to the technical and financial support from CASC. From the more "commercial" side the only other company that has been able to place a satellite in orbit is iSpace that, on July 25, 2019, successfully delivered CAS-7B, an amateur radio satellite, and a technology verification payload for China Central Television, into a 300km-

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[8] Andrew Jones, *China's Commercial Satellite Sector Sees Boost from "New Infrastructure" Policy*, SPACENEWS (May 15, 2020), https://spacenews.com/chinas-commercial-satellite-sector-sees-boost-from-new-infrastructure-policy/.

[9] *See* Xinhuanet Client, *Satellite Internet Included! National Development and Reform Commission Clarified the Scope of "New Infrastructure" for the First Time*, BAIDU (Apr. 21, 2020), https://baijiahao.baidu.com/s?id=1664541357357117216&wfr=spider&for=pc&isFailFlag=1. *See also infra* Section IV.

[10] *See* Andrew Jones, *Private Space Launch Firms in China Race to Orbit*, IEEE SPECTRUM (Apr. 26, 2019), https://spectrum.ieee.org/aerospace/space-flight/private-space-launch-firms-in-china-race-to-orbit; Mike Wall, *China Joins Private Space Race with Landmark OneSpace Rocket Launch*, SPACE.COM (May 22, 2018), https://www.space.com/40662-china-first-private-spaceflight-launch.html.

[11] Mengti Guo, *How Soon Until Private Chinese Launch Providers are Global Competitors?*, VIASATELLITE (May, 2020), http://interactive.satellitetoday.com/via/may-2020/how-soon-until-private-chinese-launch-providers-are-global-competitors/.

[12] *Kuaixhou-1A,* GUNTER'S SPACE PAGE, https://space.skyrocket.de/doc_lau_det/kuaizhou-1a.htm (last visited Mar, 17, 2021).

altitude orbit.[13] Other companies have either launched sub-orbital rockets (OneSpace)[14] or completed take-off and landing tests (LinkSpace).[15] Another interesting example is that of LandSpace, a privately-owned launch vehicle manufacturer that has raised funds up to RMB 2.5 billion.[16] After successfully testing the Phoenix liquid-oxygen/methane rocket engine, the company is now working on its Zhuque-2 medium rocket, which would make Landspace the first commercial company in China with capability to launch biggish payloads to LEO.[17]

Before proceeding with the analysis of the regulatory framework applicable to Chinese private space activities, it is important to point out some peculiar aspects of Chinese companies that distinguish them from their counterpart in the West. Generally speaking, at least from a US perspective, a commercial company is characterized by four elements: 1) its independence from governmental control; 2) the pursuit of profit; 3) being risk-taking, in the sense that it possesses a certain amount of private capital at risk; 4) to serve a wide range of customers, including governmental and non-governmental ones.[18] While some of these elements also apply to Chinese companies, they fail to highlight the complexity and the often lack of clarity that surrounds the Chinese private sector. Indeed, in Chinese literature a majority State-owned company that sells services to businesses commercially and has some private investors is viewed as "commercial" even though it is backed by the

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[13] Andrew Jones, *Chinese iSpace Achieves Orbit with Historic Private Sector Launch*, SPACENEWS (July 25, 2019), https://spacenews.com/chinese-ispace-achieves-orbit-with-historic-private-sector-launch/.

[14] Tim Fernholz, *A Chinese Firm Says it Launched the Country's First Privately Built Rocket,* QUARTZ (May 17, 2018), https://qz.com/1280638/onespace-says-it-launched-the-chinas-first-privately-built-rocket/

[15] Andrew Jones, *Chinese Linkspace Reaches 300 Meters with Launch and Landing Test*, SPACENEWS (Aug. 12, 2019), https://spacenews.com/chinese-linkspace-reaches-300-meters-with-launch-and-landing-test/.

[16] Blue Arrow Aerospace, *Blue Arrow Aerospace Completes a New Round of 1.2 Billion Yuan Financing*, WECHAT, https://mp.weixin.qq.com/s?__biz=MzA5OTQ3OTA1NA==&mid=2653171922&idx=1&sn=5a490ac7b02ed721bd89c358b4e8bded&chksm=8b512bb3bc26a2a541847defe9aa7f797116fbd34be8336b310c16cd97cd6a9fcb97d7b01554&scene=0&xtrack=1#rd (last visited Oct. 26, 2020).

[17] Andrew Jones, *China's Landscape Raises $175 Million for Zhuque-2 Launch Vehicles*, SPACENEWS (Sep. 9, 2020), https://spacenews.com/chinas-landspace-raises-175-million-for-zhuque-2-launch-vehicles/.

[18] *See* LIU ET AL., *supra* note 3, at 3-5, 27-29.

State. At the same time, a company that is mostly privately-held and sells solely to the government would also be considered commercial. Thus, when Chinese companies are scrutinized, it is advisable to take into account several factors, especially their degree of independence from government related bodies and the support that they receive. When these criteria are applied to the launching sector (the primary object of our analysis), companies may be divided in two wide groups: the first one includes entities that are directly connected to State-owned bodies and receive substantial organizational, financial, and technical support, particularly access to rocket technology; the second group consists of companies that operate independently from governmental control, receive the largest majority of funds from private sources and benefit from a minimal, and often indirect, support from governmental bodies. Among the companies belonging to the first group there are ExPace and China Rocket Co. Ltd. ExPace is nominally a commercial company but de facto is owned and backed by CASIC. ExPace operates the Kuaizhou-1A, which is derived from missile technology and is capable of lofting a 200-kilogram payload into a 700-kilometer sun-synchronous orbit.[19] The China Rocket Co. Ltd. is a commercial spinoff of CASC and operates the Jielong-1 (Smart Dragon-1) four-stage solid propellant rocket.[20] Both companies have successfully delivered satellites in orbit. The second group includes entities like iSpace, OneSpace, LandSpace, etc. While these entities operate independently from governmental bodies' control both from a decision-making and financial perspective, they often benefit from personal connections with regulators and high-level official, a factor that facilitate regulatory support from governmental authorities and possibly access to otherwise un-accessible technology. Unsurprisingly, the growth of the companies belonging to the second group has been slower than then one of the entities belonging to the first group. Nevertheless, as these companies continue to gather investment from private sources, it is likely that they will be able to provide full scale launching services in the not-too-distant future.

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[19] Stephen Clark, *Chinese Smallsat Launcher Fails*, SPACEFLIGHT NOW (Sep. 12, 2020), https://spaceflightnow.com/2020/09/12/chinese-smallsat-launcher-fails/

[20] *Jielong-1,* GUNTER'S SPACE PAGE, https://space.skyrocket.de/doc_lau/jielong-1.htm (last visited Mar, 17, 2021).

III. REGULATORY FRAMEWORK APPLICABLE TO CHINESE PRIVATE SPACE ACTIVITIES

The regulatory framework applicable to Chinese private space activities consists of two parts, the first one having general characteristics, the second one being specifically tailored to meet the demands coming from the private sector. Accordingly, the first part includes the general provisions of Chinese space law that are indeed relevant to all space activities undertaken under Chinese jurisdiction, including those carried out by private entities. The second part comprises the policies, regulations and other measures that have been issued to guide the process of privatization.

A. Chinese Space Law

i. Preliminary Remarks

China remains (at the moment) the only major spacefaring country that does not possess a comprehensive national space law. A national space law is a law that is adopted by a State to govern "national space activities," a concept that is usually associated with space activities undertaken a) by national entities, both governmental and non-governmental nature; or b) within the jurisdiction of that particular State, either on a territorial or quasi territorial (for example on board of a ship registered by that State) basis. The reason why a State enacts national space legislation is threefold: first, to better organize and manage national space activities; second, to ensure that national space activities are consistent with international (space law) obligations; third, to implement the requirements of Article VI 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[21] (Outer Space Treaty) that requires the space activities of private entities to be duly authorized by an appropriate State and continuously supervised.[22] It has to be

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

[22] *Id. See* M. Gerhard, *Art. VI*, *in* 1 COLOGNE COMMENTARY ON SPACE LAW 103-25 (Stephan Hobe, Bernhard Schmidt-Tedd & Kai-Uwe Schrogl eds., 2009) (analyzing of Article VI of the Outer Space Treaty); Franz von der Dunk, *The Origins of Authorization: Art. VI of the Outer Space Treaty and Int'l Space Law*, *in* NATIONAL SPACE LEGISLATION

understood that, under Article VI States are internationally responsible for the space activities undertaken by their national entities;[23] consequently, it is in the State's interest to put in place a framework that allows it to control by whom and how space activities are undertaken. From this perspective the adoption of a national space act is viewed as the most effective means to achieve this goal.

As said, China still does not have comprehensive national space legislation but only a handful of measures addressing limited aspects of space activities.[24] This can be explained by two elements: first, for several decades the enactment of national space legislation was not a priority for Chinese leadership; on the contrary, what mostly mattered was to close the technological gap that existed with the Western and Soviet/Russian space programs. The second element is the fact that until very recently Chinese space activities were exclusively undertaken by the State through the operation of major SOEs; hence, the enactment of detailed procedures to manage private space activities was simply not needed. However, now that certain aspects of the Chinese space sector have been opened up to the private sector, the absence of these procedures and the outdated nature of the measures that are in place have led to a growing recognition that a broader and more structured approach towards regulating Chinese space activities would be recommended, possibly in the form of a Chinese national space law. This is evident from the fact that the possible enactment of such a law has been included in the five year list of legislative items that are under consideration by the National People's Congress, the highest legislative body in China.[25] Nevertheless, this does not mean that

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IN EUROPE: ISSUES OF AUTHORIZATION OF PRIVATE SPACE ACTIVITIES IN THE LIGHT OF DEVELOPMENTS IN EUROPEAN SPACE COOPERATION 3 (Franz von der Dunk ed., 2008).

[23] *See* BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 632-36 (1997) (discussing the concept of State responsibility for national space activities).

[24] *See* Haifeng Zhao, *The Status Quo and Future of Chinese Space Legislation*, 58 ZLW 94 (2009) (For a comprehensively analyzing Chinese space law); Yun Zhao, *Regulation of Space Activities in the People's Republic of China*, *in* NAT'L REGULATION OF SPACE ACTIVITIES 247 (Ram S. Jakhu ed., 2010).; YUN ZHAO, NATIONAL SPACE LAW IN CHINA (2015); Fabio Tronchetti, *Space Law and China*, *in* OXFORD ENCYCLOPEDIA OF PLANETARY SCI. (2019), https://oxfordre.com/planetaryscience/view/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-66.

[25] *Translation: The 13th NPC Standing Committee Five Year Legislation Plan,* NPC OBSERVER https://npcobserver.com/2018/09/07/translation-13th-npc-standing-

a Chinese national space law is about to be enacted; indeed, the law has been merely listed as a low priority item, which in practice means that unless some major development occurs, the chances for it to be promulgated are rather slim.

Chinese space law consists of two departmental regulations addressing the issues of launching and registration of space objects, respectively 2001 *Measures for the Administration of Registration of Objects Launched into Outer Space*[26] and the 2002 *Interim Measures on the Administration of Licensing the Project of Launching Civil Space*.[27] It is indicative that both measures were enacted in the form of departmental regulation, that is one of the lowest levels among Chinese laws; indeed, this shows that Chinese regulators did not deem their content to have the utmost importance.

ii. The Registration Measures

The Registration measures were enacted to comply with the requirements set by the 1975 Registration Convention that demands States Parties to register their space objects in a national register as well as to transfer relevant information to the United Nations (UN) Secretary-General for inclusion in an international registry.

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committee-five-year-legislative-plan/ (last visited Oct. 19, 2020) (describing how the National People's Congress Standing Committee released its 5-year legislative plan in 2018 and the items included in that plan).

[26] 中华人民共和国国防科学技术工业委员令 中华人民共和国外交部第6号 空间物体登记管理办法 (Zhonghua Renmin Gongheguo Guofang Kexue Jishu Gongye Weiyuan Ling, Zhonghua Renmin Gonghegong Waijiaobu Di liu Hao, Kongjian Wuti Dengji Guanli Banfa) Order No. 6 of the Commission of Science, Technology and Industry for National Defense and the Ministry of Foreign Affairs of the People's Republic of China, on Registration, Launching and Licensing Space Objects, 8 February 2001, translated in Chinese Law: Registration, Launching and Licensing Space Objects, 33 J. Space L. 437 (2007) [hereinafter Registration Measures].

[27] 中华人民共和国国防科学技术工业委员令中华人民共和国外交部12号民用航天发射项目许可证管理暂行办法 (Zhonghua Renmin Gongheguo Guofang Kexue Jishu Gongye Weiyuan Ling, Zhonghua Renmin Gonghegong Waijiaobu Di Shier Hao, Minyong Hangtian Fashe Xiangmu Xukezheng Guanli Zanxing Banfa), Order No. 12 of the Commission of Science, Technology, and Industry for National Defence and the Ministry of Foreign Affairs of the People's Republic of China, Interim Measures on the Administration of Permits for Civil Space Launch Projects, 21 November 2002 [hereinafter Space Launch Measures]. (An additional instrument dealing with the mitigation of space debris was enacted in 2010).

Under the Registration Measures a space object is defined as "an artificial satellite, crewed spacecraft, space probe, space station, launch vehicle and parts thereof, and other human-made objects launched into outer space."[28] In short, two elements are required for an object to be considered as a "space object," namely 1) to be man-made; 2) to enter outer space. Sounding rockets and ballistic missiles that cross outer space only temporarily are excluded from this definition.[29]

Article 4 of the Registration Measures clarifies that registration is needed for all space objects launched from the territory of China as well as space objects jointly launched abroad by China and other States. The obligation to register space objects falls upon government departments, juridical persons, other organizations and natural persons that launch or procure the launching of a space object.[30] Article 7 of the Measures clarifies who has the primary duty to register the object by pointing out that: "[t]he owner of a space object shall register the space object. Where there is more than one owner of a space object, the main owner shall register the space object on behalf of all the owners."[31] Importantly, when a foreign owned object is launched from Chinese territory, the Chinese corporation that provides the launching service shall register the object in the national registry.

To summarize, every object launched from Chinese territory, both under domestic and foreign ownership, must be registered in the Chinese registry. This choice makes China one of the few space launch providers that registers in its national registry foreign objects that are launched from its territory.[32]

The State Administration of Science, Technology and Industry for National Defense (SASTIND)[33] is responsible for maintaining

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[28] Registration Measures, *supra* note 26, art. 2.

[29] *Id.* at art. 3.

[30] *Id.* at art. 4.

[31] *Id.* at art. 7.

[32] For example, the United States does not register in its national registry objects that are owned by foreign States/entities.

[33] "State Administration of Science, Technology and Industry for National Defense (SASTIND) is under direct supervision of the Ministry of Industry and Information Technology (MIIT)." *State Administration for Science, Technology, and Industry for National Defense*, ST. COUNCIL: CHINA (updated Oct. 6, 2014), http://english.www.gov.cn/state_council/2014/10/06/content_281474992893468.htm.

the national registry and dealing with requests of registration.[34] The registrant shall provide SASTIND with the following information sixty days from the date of the launch:[35]

> registration number, registrant, owner of the space object, an appropriate designator of the space object, basic characteristics of the space object, launching enterprise of the space object, name of the launch vehicle, date, and territory or location of the launch, basic orbital parameters of the space object, and the status of the launching and orbiting of the space object.[36]

In case some significant changes occur, such as change of ownership in orbit, inoperability of the space object, break up, cessation of function and re-entry into the earth's atmosphere, the registrant shall modify the registration accordingly within sixty days.

SASTIND is also in charge of notifying the Secretary-General of the UN about space launches undertaken by China; such a notification is made via the Ministry of Foreign Affairs, within sixty days after the registration in the national registry has taken place.[37] Such a requirement improves upon the vague language of Article 4, paragraph 1, of the international Convention on Registration of Objects Launched into Outer Space[38] (Registration Convention) that merely requires parties to furnish information "as soon as practicable." In case of joint launch by China and other foreign States, the Ministry of Foreign Affairs will decide the State of registry after consultation with the other States concerned pursuant to Article II of the Registration Convention.[39]

Overall, the Registration Measures enable China to comply with the main obligations laid down in the Registration Convention both at the national and international level. However, one may point out a couple of shortcomings, for example the lack of reference to the issue of delimitation of outer space (that is where China believes that outer space begins and national airspace ends) and the lack of provisions dealing with the transfer of ownership of space

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[34] Registration Measures, *supra* note 26, art. 5.

[35] *Id.* at art. 8.

[36] *Id.* at art. 6.

[37] *Id.* at art. 12.

[38] Convention on Registration of Objects Launched into Outer Space art. I, Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15.

[39] *Id.* at art II.

objects. The first shortcoming may become problematic in the context of sub-orbital activities, as the applicability of the Measures to such activities may become questionable. The second shortcoming is related to a practice that is becoming quite frequent and that is usually addressed within national space legislation.[40]

iii. The Space Launch Measures

The Licensing Measures are intended to lay down the regulatory framework to govern the launching of civil space objects, promote the sound development of the civil space industry, maintain national security and the public interests, and fulfill the obligations of China as a contracting State to the international outer space treaties.[41]

The Licensing Measures establish a detailed procedure to license the launch of civil space objects. Importantly, the licensing of military space launches goes outside the scope of the Measures.

The Licensing Measures apply to the "project of launching civil space objects," an activity that is defined as the launching of space objects from Chinese territory for non-military purposes as well as to the launching of space objects from foreign territory with the space object being owned by China or its ownership being transferred to Chinese natural or juridical persons or organizations.[42] It is thus evident that China understands the concept of national space activities, as far as civil launches are concerned, on a territorial and personal basis.

The general project contractor or the final owner of the satellite, or other spacecraft, shall apply for the license nine months prior to the launch.[43] Pursuant to Article 5 of the Measures the applicant shall act in conformity with the laws and regulations of China, preserve national secrets and refrain from actions endangering national security. Additionally, it shall: 1) be in possession of all relevant documents issued by the competent State departments; 2) have financial and technical means to undertake the project; 3) not cause irremediable danger to public health, safety or

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[40] On the practice of transfer objects in orbit, see Michael Chatzipanagiotis, *Registration of Space Objects and Transfer of Ownership in Orbit*, 56 ZLW 229 (2007).

[41] Space Launch Measures, *supra* note 27, art. 1.

[42] *Id.* at art. 2.

[43] *Id.* at art. 6.

property;[44] and 4) comply with environmental protection law.[45] SASTIND is in charge of reviewing the application and deciding whether or not to grant the license. The decision shall be made within thirty days from the receipt of the application.

A license shall indicate the name and address of the licensee, the main elements of the project, the time frame of the launch and the duration of the project. A license cannot be altered or transferred[46] and it shall be immediately terminated once the project is completed.[47]

The licensee is under the obligation to obtain an insurance to cover liability for damage caused to third parties and other liability cases incurred by launching a space object.[48] While the application is under review, the applicant shall be able to show pre-contract insurance commitments and provide adequate information.

The licensee shall comply with the terms of the license and with the laws and regulations of China. In case it fails to do so, SASTIND shall order the licensee to rectify the violation and shall withdraw the license if the breach of the license is serious.[49] Additionally, depending on the gravity of the violation administrative penalties can be imposed on the licensee.[50] If the violation amounts to a criminal act the licensee shall face charges of criminal liability.

Overall, the Licensing Measures give China the tools to comply with the requirements of Article VI, paragraph 2 of the Outer Space Treaty, specifically the duty to supervise and authorize private space activities.[51] It is, however, worth pointing out that several aspects render the measures somewhat controversial and outdated. First, its precise scope is not entirely clear; in particular, is the licensing only related to the mere launch of a space object or also to the activities that it performs once in orbit? Similarly, is the requirement to obtain third party liability insurance only relevant to the launch per se or also extends to the in-orbit activities (in-orbit insurance)? With respect to the insurance requirement there is also

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[44] *Id.* at art. 5.
[45] *Id.* at art. 6.
[46] *Id.* at art. 12.
[47] *Id.* at art. 11.
[48] *Id.* at art. 19.
[49] *Id.* at art. 16.
[50] *Id.* at art. 24.
[51] Outer Space Treaty, *supra* note 21, art. VI.

uncertainty as to its amount as well as the criteria used to determine it. Additionally, there is no mention of the possibility to lower the insurance requirements in the event of the launch of small satellites, a provision that is often found in more recent national space legislation. Another element that indicates the outdated nature of the Measures is the absence of any reference to space debris and space debris-related accidents or events.

B. Regulatory Framework Applicable to Chinese Private Space Activities

The involvement of private entities in space activities is to be understood in the context of a general trend occurring in China characterized by the access of non-governmental entities to areas previously under the exclusive control of SOEs. Undoubtedly, the participation of private entities to space activities has benefited from the gradual yet steady support from the government in the form of policies, regulations and other administrative measures. This support is motivated by three factors; first, the need to alleviate the China National Space Administration (CNSA) and the main SOE, *in primis* CASC and CASIC, of the burden to provide all sorts of space-related services, for instance the launch of small satellites; second, the regulated growth of an active private sector is deemed vital to sustain long-term economic and technological development; finally, the willingness to match the achievements reached by the American private space sector.

The official first step taken by Chinese regulators to encourage private players to take part in space activities was taken in 2014 when the State Council[52] issued the Guiding Opinions of the State Council on Innovation of Investment and Financing Mechanisms in Key Fields to Encourage Social Investment[53] (State Council's Document 60). The document suggests new policy measures to allow for more strategic (and private) investments and growth in seven broad

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[52] The State Council is the highest administrative body of the People' Republic of China. It carries out the laws enacted and decisions adopted by the National People's Congress and its Standing Committee. Among its functions, the State Council formulates administrative measures, enacts administrative regulations, and promulgates decisions and orders. *The State Council*, ST. COUNCIL: CHINA (last updated Mar. 17, 2018), http://english.www.gov.cn/archive/china_abc/2014/08/23/content_281474982987314.htm.

[53] *See supra* note 2.

areas of interest, including in civil space infrastructure. Section 7 (2, 3, 4) of the Document explicitly mentions the space industry, by soliciting private capital investment in the telecommunication industry and information industry and by recommending the implementation of various measures to facilitate the involvement of private entities. Furthermore, it encourages private capital to participate in the construction of civil space infrastructure and calls for private capital to develop, launch, and operate commercial remote sensing satellites and provide commercial services.

State Council's Document 60 represents the first ever official documents to explicitly encourage the participation of private entities in the space sector and, thus, to formally open it up to private investment. Some have questioned its effective relevance of the Document by pointing out that it only opens up the remote sensing and launch sectors while leaving aside historically more profitable sectors such as satellite communications.[54] It is certainly true that the scope of the Document is limited, in terms of the sector that it specifically addresses. However, its importance should not be underestimated. First of all, the official endorsement from the central government is crucially important to make the private sector feel confident about investing in a certain sector, as political and regulatory support is to be expected in the years that follow. The large number of companies established since 2014 is indicative of this fact. Secondly, it seems reasonable for Chinese regulators to take a gradual, step-by-step, approach to the privatization of space activities, by first opening up certain areas and then move to others.

Since 2014, the central government has continued to give its support towards the growth and involvement of the private sector in space activities. For instance, as part of the Belt and Road Initiative (BRI), private investments have been channeled to contribute to satellite launches, manufacturing and other projects. Additionally, in 2016 a revised spectrum licensing procedure became effective through the People's Republic of China Radio Regulations.[55] In 2019, the National Reform Development Commission (NRDC) issued an updated industrial catalogue (全国鼓励外商投资产业目录) to encourage foreign investment in a number of previously closed

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[54] *See* LIU et al., *supra* note 3, at 14.

[55] 中华人民共和国无线电管理条例 (Zhonghua Renmin Gongheguo Wuxiandian Guanli Tiaoli) People's Republic of China Radio Regulations, effective Dec. 1, 2016.

industries, including civil satellite design and manufacturing, civil satellite payload manufacturing, civil satellite component manufacturing, on-board testing equipment manufacturing, satellite communication system equipment, and civil satellite application development (NDRC 2019). Effectively, this new policy opens the door for private companies in China to secure foreign investments in domestic space projects. In April 2020, the National Development and Reform Commission added satellite internet to its list of new infrastructures. This move, that sent a clear signal to the industry that the Chinese government supports the development of satellite internet applications, was followed by the announcement of several privately driven projects in this area. Another important factor that has contributed to the speedy growth of the private space sector, especially to the development of launch vehicles by private entities has been the civil-military integration strategy. This strategy has facilitated the transfer of restricted technologies to approved firms in order to promote innovation in dual-use technology as well as to develop new supply chains and lower costs.[56]

The most significant development from a legal perspective occurred in 2019 when SASTIND and the Equipment Development Department of the Central Military Commission (EDDCMC) issued the Notice on Promoting the Systematic and Orderly Development of Commercial Carrier Rockets[57] (Notice). The Notice consists of six parts plus the annex. It begins by pointing out that its goal is to facilitate the implementation of national strategies, such as the innovation driven development and the civil-military integration, in relation to the production, testing, launching and technical control

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[56] For an analysis of the strategy of civil and military integration, see Toby Warden, *A Revolutionary Evolution: Civil-Military Integration in China*, AUSTL. INST. OF INT'L AFF. (Oct. 1, 2019), http://www.internationalaffairs.org.au/australianoutlook/a-revolutionary-evolution-civil-military-integration-in-china/; Audrey Fritz, *China's Evolving Conception of Civil/Military Collaboration*, CTR. FOR STRATEGIC & INT'L STUDIES (Aug. 2, 2019), https://www.csis.org/blogs/trustee-china-hand/chinas-evolving-conception-civil-military-collaboration.

[57] 国家国防科技工业局中央军委装备发展部关于促进商业运载火箭规范有序发展的通知 (Guojia Guofang Keji Gongyeju, Zhongyang Junwei Zhuangbei Fazhanbu Guanyu Cujin Shangye Yunzai Huojian Guifan Youxu Fazhan De Tongzhi) Notice of the State Administration of Science, Technology and National Defense and the Equipment Development Department of the Central Military Commission on Promoting the Systematic and Orderly Development of Commercial Carrier Rockets, effective May 30, 2019. In Chinese at http://www.gov.cn/zhengce/zhengceku/2020-03/24/content_5494956.htm [hereinafter Notice].

of commercial rockets.[58] Section I, "General Principles" provides a series of definitions of terms used in the Notice and addresses the issue of security in connection with the research and production of commercial rockets. The Notice defines 'commercial carrier rocket-related activities' as the research, development, and production of carrier rockets and the launch of rockets into space for commercial use conducted by various enterprises using their own funds, social capital, or joint venture capital.[59] It is, thus, evident that the Notice's provisions regulate the production of commercial rockets through all the phases of their development from the research stage to the readiness for launch. Additionally, the Notice defines 'scientific research and production activities of commercial carrier rockets' as: innovative research and development, research and production, testing and verification, launching services of expendable carrier rockets (including suborbital sounding rockets that carry instruments from 30 to 200 kilometers above the surface of the Earth), reusable carrier rockets, reentry and return launch vehicles, and other system-level or subsystem-level products.[60] Once again, the Notice utilizes a broad approach that covers a wide range of activities and a variegate set of rocket technology (including sounding rockets). After having provided the above definitions, the Notice deals with the issue of security, by stressing that the production and utilization of rockets have serious security implications both from a national perspective and from the security of outer space and that all space-faring countries have put it under strict safety supervision.[61] Based on this premise, the Notice puts in place a rather complex three stages procedure that a commercial rocket enterprise must go through before being entitled to research and produce rockets. Accordingly, the carrier shall carry out its activities only after: 1) completing registration in accordance with the Administrative Provisions on the Registration of Business Scope of Enterprises; 2) receiving the approval from the SASTIND; 3) obtaining a license for the scientific research and production of weaponry.[62] Section II of the Notice further elaborates upon the

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[58] *Id.* at Preamble.
[59] *Id.* § I, ¶ 1s.
[60] *Id.* § I, ¶ 3.
[61] *Id.* § I, ¶ 1.
[62] *Id.* § I, ¶ 4.

procedure by clarifying that license management over the projects listed in the catalogue of licensed weapons and equipment is the responsibility of SASTIND.[63] In order to favor the development of commercial rocket enterprises scientific research and testing of rockets on one side and their production on the other, are regulated separately and subject to different licensing regime (respectively, a "research license" and a "production license").[64] Section III of the Notice deals with the actual launch of a commercial rocket and it does so by making reference to the already described Space Launch Measures. Accordingly, a commercial carrier operator that wishes to launch a rocket shall apply for a license under the Measures, indicating, inter alia, its registration of orbital frequencies, debris mitigation measures and the purchase of a valid third-party liability insurance.[65] Additionally, the commercial enterprise shall pass a special review from the EDDCMC. Launching tests shall only be conducted after having received a launch license and passed the special review. Section IV of the Notice regulates the operation of launching and testing sites. As far as launching is concerned, before submitting an application for a launching license, a commercial rocket enterprise shall complete technical coordination with a nationally recognized launching site, prepare an outline of rocket launching and space flight, and, after the rocket enters the site, strictly observe the relevant provisions concerning the supervision of the safety and security at the launch site.[66] With respect to testing and verification without the launch of a space vehicle, relevant activities shall be conducted by using facilities of governmental authorities and enterprises[67]. Before conducting the activity, a commercial rocket enterprise shall coordinate with the testing site in matters such as technical guarantee for launching tasks and security protection, and organize the implementation upon approval of

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[63] SASTIND's license management task is to be conducted in accordance with the Regulations on Administration of the License of Scientific Research and Production of Weaponry. *See State Administration for Science, Technology, and Industry for National Defense (SASTIND)*, NUCLEAR THREAT INITIATIVE (last updated July 13, 2012), https://www.nti.org/learn/facilities/781/.

[64] Notice, *supra* note 57, § II, ¶ 5.

[65] *Id.* § III, ¶¶ 7-8.

[66] *Id.* § IV, ¶ 10.

[67] *Id.* § IV, ¶ 11.

the competent department.[68] In the event of both launching and testing, adequate measures shall be taken to ensure the safety of the environment at the launching site, flight testing zone, and landing or recovering zone.[69] Section 5 of the Notice deals with Safety and Export control matters. This Section emphasizes the need for all provincial administrative departments of science, technology, and industry for national defense to effectively supervise and inspect the scientific research and production safety of the commercial rocket enterprises within their respective jurisdictions. Furthermore, it points out that commercial rocket enterprises shall strictly observe the administrative regulations on the quality of military products and launching safety along with any other relevant safety regulation.[70]

In regard to export control, the Notice distinguishes between research and production from the handling of carrier rockets during the process of scientific research and production of commercial carrier rockets, the owners of relevant technologies and products may not transfer the technologies or products in any form to the relevant entities that have not received the qualification or a license of scientific research and production of weaponry.[71] Carrier rockets, special materials and technologies, as well as dual-purpose materials, technologies and services fall under the scope of relevant regulations of the State on export control. Thus, when transferring technologies and services within the scope of export control to any domestic entities, the enterprises shall clearly indicate the sensitive nature of the transferred material.[72] In the event of transfer of materials, technologies and services overseas, any transaction shall be

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[68] *Id.*

[69] *Id.* § IV, ¶ 12.

[70] *Id.* § V, ¶ 14, 国家国防科技工业局中央军委装备发展部关于促进商业运载火箭规范有序发展的通知 (Guojia Guofang Keji Gongyeju, Zhongyang Junwei Zhuangbei Fazhanbu Guanyu Cujin Shangye Yunzai Huojian Guifan Youxu Fazhan De Tongzhi) Notice of the State Administration of Science, Technology and National Defense and the Equipment Development Department of the Central Military Commission on Promoting the Systematic and Orderly Development of Commercial Carrier Rockets, effective May 30. In Chinese at http://www.gov.cn/zhengce/zhengceku/2020-03/24/content_5494956.htm.. This paragraph specifically refers to Regulations on the Safety Management of Hazardous Chemicals, the Regulations on the Safety Management of Explosives for Civilian Use and the Interim Measures for the Safety Management of Hazardous Chemicals for Military Use, as well as the requirements for safe transportation of military products.

[71] *Id.* § V, ¶ 15.

[72] *Id.* § V, ¶ 16.

subject to prior approval by the national export control department and written notification of the transaction shall be kept for ten years for future reference.[73]

The final section of the Notice encourages commercial enterprises to make full use of military facilities, including launching and testing sites, for all the activities covered in the Notice and to enter into an authorization contract and a confidentiality agreement with the relevant SOEs and public institutions.[74] This interaction shall be based on the requirements set by the Opinions of the General Office of the State Council on Promoting Deep Development of the Military-civilian Integration in Science, Technology and Industry for National Defense and other relevant measures.

IV. COMMENTARY TO THE REGULATORY FRAMEWORK APPLICABLE TO CHINESE PRIVATE SPACE ACTIVITIES

The private space sector in China has grown at a remarkable speed. Such growth has been influenced by several factors of political, strategic, and economic nature. The involvement of private entities in Chinese space activities should not be viewed as a surprising development but rather as a natural outcome of the process of expansion of the Chinese space program and the consequent request for space related services. While in principle the CNSA, CASC, CASIC and other organizations are capable of meeting the demands coming from governmental and non-governmental customers, it is evident their need to focus human and financial resources on more ambitious projects, such as those associated with space exploration and utilization. One shall also not underestimate the strategic importance of matching the success of the privatization of American space activities, particularly in the area of launching services, and the positive economic impact deriving from an active and successful private space sector, in terms of innovation and creation of jobs.

As described in the previous section, Chinese authorities have taken steps to enable and guide the process of privatization. As such a process is still in its initial stage, unsurprisingly also the framework that governs it is still in its basic form and in need of further

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[73] *Id.*

[74] *Id.* § VI, ¶ 17.

refinement. It is, indeed, evident that the strategy of Chinese regulators was to first lay down general principles to kick off privatization and then to issue more specific rules to enable more advanced development in selected areas.

In short, a step-by step approach has been endorsed, consisting in: a) slowly opening up the space industry to the private sector; b) assessing whether there was sufficient interest coming from the private side; c) and then gradually putting in place the required regulatory measures. This strategy can be observed by considering the following two examples. First, in April 2020 the National Development and Reform Commission (NDRC) announced the addition of satellite internet applications to the list of new infrastructures. This announcement begins by pointing out that satellite internet applications consist of three main aspects; 1) the information infrastructure (the new generation of information technology through 5G and Internet of Things); 2) the integration of infrastructure (applying internet and artificial intelligence data to upgrade the traditional infrastructure); 3) innovative infrastructure (promoting scientific research and technology and product development). After that, the announcement lists the overall goals of the NDRC with respect to satellite internet applications, respectively: a) to strengthen the top-level design, mostly through the release of guidance on how to promote the development of new types of infrastructure; b) to optimize the policy environment through revision and optimization of rules; 3) to accelerate the implementation of ongoing projects, such as the deployment of 5G networks and the upgrade of fiber broadband networks; d) to enhance overall coordination. Evidently, these are all general objectives that require additional regulatory measures to be fully implemented; the 2020 announcement, thus, represents only the first step in regulating the satellite internet application sector. It is arguable that, in light of the positive response that the announcement has received, such measures will be issued relatively quickly. The second example, that concerns the area of private space launching, fully highlights the path chosen by Chinese regulators that begins with the formulation of general objectives and ends with the enactment of more structured rules. In 2014, State Council's Document n.60 encouraged private capital to participate in the construction of national space infrastructure, particularly in the development and operation

of launching vehicles.[75] Such a call was positively received by private entities that began manufacturing and testing rocket technology and gradually receiving financial support from private donors. In June 2019, as the launching sector was beginning to show significant technological progress, Chinese authorities issued the Notice on Promoting the Systematic and Orderly Development of Commercial Carrier Rockets so as to give a proper regulatory foundation to guide these activities and to clarify the applicability of existing rules to the private commercial rocket industry.

The Notice constitutes the most elaborated instrument to govern Chinese private space activities as well as the latest addition to the body of Chinese space law. For this reason, it seems appropriate to analyze it by pointing out its positive features and shortcomings. First, the Notice is to be viewed as a positive development because, on one side it shows the continuous support of the Chinese government towards the growth of the private space launching industry and, on the other side, it indicates that such a growth is deemed to be of strategic and economic relevance. Second, the Notice provides direction to several "young" companies that may not be well experienced in operating in technologically challenging and highly competitive environments like the space launch sector. Third, the Notice clarifies the procedure that an entity must undergo in order to be entitled to carry out research and development of rocket launch technology, including the indication of the responsible authorities, the applicable laws and the overall time frame. Up to 2019 the absence of a clear procedure created widespread uncertainty as to what steps an entity was supposed to take before considering investing in the launching sector and which authority should be contacted to get the proper permission. This uncertainty not only discouraged potential entities and investors but also caused unexpected problems to those companies who had indeed decided to participate in this business. Obviously, having a clear procedure is particularly important for those companies who have yet to access the commercial carrier rockets sector as it enables them to assess whether doing so it is consistent with their company portfolio and resources. However, it is also beneficial to the entities who are already engaged in carrier rocket research, production, and testing,

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[75] *See supra* Part III.

as it clarifies the applicable legal and administrative framework. Fourth, the enactment of the Notice is a sign of the maturity of the Chinese space program and an indication that Chinese authorities consider it important to couple technological advancement with adequate rules to guide it. This could also be viewed as a move that demonstrates the awareness of Chinese regulators of the outdated nature of the country's national space law and the need to modernize it.

Additionally, many of the Notice's rules bring China close to the way other countries regulate the involvement of private entities in the production and launch of space commercial carrier vehicles.[76] Indeed, according to the Notice, orbital launches must be conducted at "approved" sites, which means one of the four national launching sites in Jiuquan, Xichang, Taiyuan, and Wenchang. Interestingly, space launch sites are similarly regulated in the US as all orbital launches take place at government facilities. China has also positively taken several measures to ensure that the development of private commercial carrier rockets is done in a manner that does not undermine national security by, for example, restricting the export of rocket technology. Similarly, the United States' rules prevent rocket makers from hiring foreign nationals or allowing them into manufacturing facilities. Additionally, Chinese authorities have also prohibited commercial carrier rocket enterprises from producing any kind of assault weapon.

Despite these positive aspects, a number of shortcomings complicate the implementation of the Notice and potentially undermine its ultimate goal to promote the private space launch industry. These shortcomings emerge when the provisions of the Notice are analyzed individually as well as in connection with other pre-existing rules. First, the procedure that a company has to undergo to be authorized to carry out commercial carrier rocket-related activities appears to be extremely burdensome and complex, including several reporting and licensing requirements to the SASTIND and EDDCMC. This procedure is time-consuming, technologically and financially challenging and at every step of the way unexpected obstacles may occur. It is, thus, questionable, whether this framework

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[76] *See* Zhang Jingnan, *Interpretation of the Main Points of "Standard and Orderly Development of Commercial Launch Vehicle"*, WEXIN.QQ.COM (June 17, 2019), https://mp.weixin.qq.com/s/ZQIxIX9Cua5tvj7dSoZdxg (translated from Chinese).

is suitable to attract newcomers to the space launch industry or if it has, instead, the opposite effect by discouraging them due to the challenging road ahead. Thus, it appears that the procedure is more tailored to sort of "certify" the characteristics and capabilities of the companies that are already engaged in the research and production of carrier rockets, and that have indeed already met the requirement set by the Notice itself, rather than attracting potential new players. The core of the issue is that the procedure deems commercial carrier rockets as 'weapons' and regulates them accordingly. While it is fully understandable from the perspective of Chinese regulators to take steps to make sure that national security interests are preserved in relation to the development of sensitive technology like rockets, one has to wonder whether the development of carrier rockets that are intended to be used exclusively for civil purposes could have been regulated in a less stringent way. For instance, existing military requirements could have been adapted to the civil nature of the technology at stake, even though still under an effective regime of control and supervision.

Second, the full extent of the applicability of the Notice to the entities already involved in rocketry remains somewhat uncertain. For instance, if an entity has already been licensed to produce a certain kind of carrier rocket, can the same model of rocket be used for further research, namely to develop an upgraded version of it without applying for a new research license? Furthermore, if a company has been successful in getting through the process required to research and produce carrier rockets, shall that company benefit from a "fast-track" for future applications? Another notable aspect that the Notice does not address is that of the 'sustainability' of the commercial space industry in China; indeed, the combination of a burdensome licensing procedure with the highly competitive space launch market makes one wonder whether Chinese entities can sustain their progress in the years to come. In order for this to happen, it would probably be advisable, at least at an early stage, for the government to become a regular customer of private space launching services as well as to enable the launch of foreign objects. Considering the State-centric nature of the Chinese structure it is also possible that, if needed, the government could subsidize private companies and allow them to underprice space launches to attract more (foreign) customers.

Another somewhat problematic aspect is the relation between the Notice and the 2002 Interim Measures on the Administration of Permits for Civil Space Launch Projects (the Space Launch Measures). The Notice clarifies that when a commercial rocket enterprise engages in the launching of rockets to space it shall apply for a license under the Space Launch Measures. The previous section has already highlighted the limits of these measures; most importantly, when enacting the 2019 Notice, no steps have been taken to adapt the Measures to the specific characteristics of commercial carrier rockets and the services that they provide. Few examples may better explain this point. The Space Launch Measures (as also pointed out by the Notice) require an applicant to purchase a third-party liability insurance; however, considering the small size of the rockets manufactured by Chinese entities, the fact that their research and production is strictly controlled and that they are capable of launching only small (nano) satellites, regulators could have considered to lower the amount of the insurance coverage to be purchased or even waiving this requirement. Such a move would have been beneficial to the nascent commercial carrier rocket industry and would have put Chinese rules in line with those enacted by other countries.[77]It is also not fully clear whether the insurance requirement only refers to the launching phase or also to the in-orbit portion of the space activity, an important element that may add additional costs to the space launch provider and satellite operators. An additional element to be considered is the impact of military authorities in the launch and operation of a commercial carrier rocket, particularly in relation to the launch of foreign objects. According to the Notice, commercial carrier rocket operators must launch their space vehicles at nationally recognized space launch sites and make full use of facilities and equipment for major military activities. It remains to be seen what kind of legal protection will be given to foreign entities that decide to launch their space objects on board of privately owned and operated Chinese space launch vehicles, especially in terms of preservation of their

[77] For example, Art. 7(4) of the 2011 Austrian Outer Space Act foresees the possibility to lower or even waive the insurance requirement if the activity is in public interest, an assessment that is based on the danger of the planned activity and the financial situation of the operator. BUNDESRECHT KONSOLIDIERT: GESAMTE RECHTSVORSCHRIFT FÜR WELTRAUMGESETZ [AUSTRIAN OUTER SPACE ACT] https://www.spacelaw.at/documents/2012/Austrian_Outer_Space_Act.pdf.

technological and proprietary rights. Overall, the Notice seems to focus exclusively on protecting national security interests through the licensing procedure and the application of export control restrictions while leaving largely unaddressed the issues related to the participation of foreign entities in Chinese space activities, a participation that might be necessary to sustain the activities of Chinese private space entities.

V. CONCLUSION

For the past six years, the process of privatization of Chinese space activities brought about important changes to the once closed and exclusively State enterprise-controlled space sector. Chinese authorities promoted this process through the adoption of policies, rules, and other measures. The strategy put in place by Chinese regulators has been to first issue general policies to encourage private participation in space activities and then to move to more detailed regulations. The case of the private space launch sector is exemplificative of this strategy.

As the privatization of Chinese space activities enters a more mature stage, it seems appropriate for Chinese authorities to continue the process of refinement of the legal framework that governs it. This recommendation applies to all sectors affected by the ongoing privatization, including that of civil space launch, which is the one that has received the largest regulatory attention so far. With respect to the regulation of civil commercial carrier rocket activities Chinese law-makers should consider to: a) adapt existing rules and requirements to the specificities of private operators; b) clarify the military and civil relation: c) promote competitiveness in the international market. Ultimately, the key to the long-term success of the privatization of Chinese space activities depends on a combination of several factors, including the continuous support from the central government, its orderly and properly supervised growth, the creation of favorable conditions to enable private entities to achieve their full technological and creative potential and the ability to attract not only domestic but also foreign customers.

COMMENTARY

ARTEMIS: THE DISCORDANT ACCORDS

Sa'id Mosteshar[*]

INTRODUCTION

Professor Bin Cheng regarded public international law as a civilizing influence on the conduct of and relations among nations.[1] The international law of outer space has been a classic example of such influence.

The Outer Space regime has at its center principles that have guided activities in space over decades in an international atmosphere of collaboration and mutual respect. Prime among these principles are peaceful use, benefit of all people irrespective of economic or scientific development, non-appropriation, international co-operation, state responsibility and liability.[2]

In recent years there has been a tendency to pursue short-term national interests that put at risk international harmony in outer space. Among these are unilateral declarations and municipal laws that detract from or undermine prevailing international consensus.

To examine the relationship between municipal law and public international law governing space activities, with reference to recent developments in the United States relating to the exploitation of space resources, the law governing such resources needs to be considered.

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[1] View expressed by Professor Cheng in conversations over many years.

[2] *See* 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].

SPACE RESOURCES

The non-appropriation principle is fundamental to the outer space legal framework, articulated in the second Article of the Outer Space Treaty:

> 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*.[3]

In pursuit of their perceived national interests some States argue that this prohibition is confined to territorial sovereignty and does not apply to appropriation of space resources. Others take a more literal and perhaps stronger view of its effect, considering commercial exploitation of space resources a breach of the Outer space Treaty.

Those favoring space resource exploitation have argued that:[4]

1. The prohibition applies only to States and not to private entities;

2. Article II only prevents assertion of sovereignty and territorial appropriation, supported by references to claims of sovereignty and occupation;

3. Extraction of resources from space is analogous to fishing in the High Seas, also outside the territory of any State.[5]

In response to each of these arguments those opposing space resource exploitation argue *inter alia*:[6]

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[3] *Id.* at art. II (emphasis added).

[4] *See e.g.,* Thomas Cheney, *Managing the Resource Revolution: Space Law in the New Space Age*, in FRONTIERS OF SPACE RISK: NATURAL COSMIC HAZARDS & SOCIETAL CHALLENGES 245-69 (Newman, Christopher J, & Wilman, Richard J. eds., 2018).

[5] *See e.g.,* Lorenzo Gradoni, *L'astéroïde Est-il Un Poisson de Haute Mer?* [Is the Asteroid a Deep Sea Fish?], MAX PLANCK INST. FORUM, 35 (Dec. 2017), https://www.academia.edu/35341700/L_ast%C3%A9ro%C3%AFde_est_il_un_poisson_de_haute_mer?auto=download; Mahulena Hofmann & Federico Bergamasco, *Space Resources Activities from the Perspective of Sustainability: Legal Aspects*, 3 GLOBAL SUSTAINABILITY, 1 (2020), https://doi.org/10.1017/sus.2019.27.

[6] *See e.g.,* 161 Cong. Rec. H3513 (2015)(letter from Joanne I. Gabrynowicz dated May 12, 2015); 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); Fabio Tronchetti, *Legal Aspects of Space Resource Utilization in* HANDBOOK OF SPACE LAW 769-813 (F. von der Dunk & F. Tronchetti, eds. 2015); Fabio Tronchetti, *The*

1. Article VI of the Outer Space Treaty contradicts limitation to only States and not private entities. The State is internationally responsible for all its national activities in space. It has the obligation to ensure that its nationals do not conduct space activities without authorization and that they comply with the terms of the Outer Space Treaty.

2. If the intention were to confine the Article to territorial sovereignty the words following *sovereignty* are redundant. Further, the Outer Space Treaty was concluded after the Convention on the High Seas[7] and the Antarctic Treaty,[8] both of which address limitations on the claim of sovereignty in terms not invoking appropriation. They respectively provide:

> The high seas being *open to all nations*, no State may validly purport to subject any part of them to its *sovereignty*.[9]

> *No acts or activities* taking place while the present Treaty is in force shall *constitute a basis for asserting*, supporting or denying a claim to *territorial sovereignty* in Antarctica.[10]

It is argued that the parties to the Outer Space Treaty must be assumed to have intended a broader prohibition than the exertion of territorial sovereignty. Absent such clear limitation the Treaty must be interpreted according to the ordinary meaning of the words used.[11] The Oxford English Dictionary defines "appropriation" as "making of a thing private property, whether another's or (as now commonly) one's own; taking as one's own or to one's own use.[12] Further, the Article does not limit

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Space Resource Exploration and Utilization Act: A Move Forward or a Step Back?, 34 SPACE POL'Y 6, 7-9 (2015); Steven Freeland & Ram S. Jakhu, *The Intersection Between Space Law and International Human Rights Law*, *in* THE ROUTLEDGE HANDBOOK OF SPACE LAW 234, (Ram S. Jakhu & Paul Stephen Dempsey eds., 2017).

[7] Convention on the High Seas, Apr. 29, 1958, 450 U.N.T.S.11 [hereinafter Convention on the High Seas].

[8] The Antarctic Treaty art. 1, Dec. 1, 1959, 12. U.S.T. 794, 42 U.N.T.S. 71 [hereinafter Antarctic Treaty].

[9] Convention on the High Seas, *supra* note 7, art. 2 (emphasis added).

[10] Antarctic Treaty, *supra* note 8, art. IV (2) (emphasis added).

[11] Vienna Convention on the Law of Treaties art. 2(1)(a), May 23, 1969, 1155 U.N.T.S. 331 [hereinafter Vienna Convention]. *See* BIN CHENG, GENERAL PRINCIPLES OF LAW AS APPLIED BY INTERNATIONAL COURTS AND TRIBUNALS 107 (2006).

[12] OXFORD ENGLISH DICTIONARY, https://www.oed.com/oed2/00010966 (last visited Feb. 20, 2021).

appropriation to the assertion of sovereignty as evidenced by the use of the phrase "*by any other means*."

3. The freedom to fish in the High Seas is recognized by the Convention on the High Seas[13] to be a legal right under general international law.[14] This is a right accepted by States as lawful and exercised for centuries, fulfilling the requirements for a principle of general international law on any view of the elements needed for its establishment.[15] There exists no such right to extract space resources.

It can further be argued that if appropriation of space resources were permitted under Article II of the Outer Space Treaty, much of the Moon Agreement[16] would be redundant or in conflict with the Outer Space Treaty, particularly provisions of Article 11 of the Moon Agreement.

ARTEMIS PROGRAM AND BACKGROUND

As States have increased their reliance on space for military and civil affairs the level of co-operation and views of the treatment of space have shifted. Technological advances and development of low-cost spacecraft and systems with greater capabilities combined with growing concentration of wealth have led to increasing interest in privately funded space ventures.

Responding to this changing environment in 2015 the United States enacted the Commercial Space Launch Competitiveness Act[17] (2015 Act) granting citizens of the United States the right to commercial recovery of space resources.[18] The Act also provides for measure to be taken by the President to facilitate its objectives.[19]

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[13] Article 2 of the Convention enumerates four freedoms and states in conclusion of the Article that "These freedoms, and others, *which are recognized by the general principles of international law. . .*" Convention on the High Seas, *supra* note 7, art. 2 (emphasis added).

[14] CHENG, *supra* note 11, at 23-24. It will be noted that even if long practice were required, it is satisfied in the case of fishing. *See* BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 136 (1997).

[15] CHENG, *supra* note 14, at 136.

[16] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, Dec. 18, 1979, 1363 U.N.T.S. 3 [hereinafter Moon Agreement].

[17] 51 U.S.C. § 51303 (2018).

[18] *Id.*

[19] 51 U.S.C. § 51302.

On April 6, 2020, acting under that power, the President issued an Executive Order[20] (April Order) linking participation in the National Aeronautics and Space Administration's (NASA) Artemis Program[21] (Artemis Program) to international acceptance and legitimization of the United States' view on space resource appropriation.

The Artemis Program changes the policy on returning to the Moon, with a new mission to the Moon to be followed by missions to Mars and beyond, led by the United States with private sector participation.[22] The April Order adds:

> Americans should have the right to engage in commercial exploration, recovery, and use of resources in outer space, consistent with applicable law. . . . 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*.[23]

Shortly following the release of the April Order, NASA announced the Artemis Accords[24] that set out the requirements for international partners' participation in the Artemis Program. To execute the Program in partnership with international agencies and entities NASA prepared, and on May 5, 2020, announced a set

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[20] Exec. Order No. 13,914, 85 Fed. Reg. 20,381 (Apr. 6, 2020) [hereinafter April Executive Order].

[21] ARTEMIS PLAN, NASA'S LUNAR EXPLORATION PROGRAM OVERVIEW (Sep. 2000), https://www.nasa.gov/sites/default/files/atoms/files/artemis_plan-20200921.pdf [hereinafter ARTEMIS PLAN].

[22] *Id.* at 9. *See* April Executive Order, *supra* note 20; Space Policy Directive-1, 82 F.R. 59,501 (Dec. 14, 2017).

[23] April Executive Order, *supra* note 20, §1 (emphasis added). It is notable that the United States Supreme Court has indicated that "the President's power to see that the laws are faithfully executed refutes the idea that he is to be a lawmaker." Youngstown Sheet & Tube Company v. Sawyer, 343 U.S. 579, 587 (1952). However, the use of Executive Orders by the United States President has become increasingly common. *See* Tamara Keith, *With 28 Executive Orders Signed, President Biden is Off to a Record Start*, NPR.ORG (Feb. 3, 2021), https://www.npr.org/2021/02/03/963380189/with-28-executive-orders-signed-president-biden-is-off-to-a-record-start.

[24] 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 (last visited Oct. 15, 2020) [hereinafter Artemis Accords].

of bilateral arrangements under which partners could participate in the Program.[25]

The "principles" of the Accords were disclosed in general terms and are subject to negotiation with potential partners. They largely follow those of the Outer Space Treaty, with some significant differences.[26] Among these principles are acceptance of the United States interpretation of Article II of the Outer Space Treaty as permitting appropriation of space resources[27] and consequent rejection of the provisions of the Moon Agreement as part of general international law that would be binding on States not parties to the Moon Agreement, including the United States, as directed by the April Order.[28]

The April Order makes clear that the United States explicitly accepts that the Outer Space Treaty can be interpreted to prohibit appropriation and therefore ownership of space resources, and that Article 11 of the Moon Agreement could form part of general international law binding on the United States:

> Uncertainty regarding the right to recover and use space resources, including the extension of the right to commercial recovery and use of lunar resources, however, has discouraged some commercial entities from participating in this enterprise. Questions as to whether the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (the "Moon Agreement") establishes the legal framework for nation states concerning the recovery and use of space resources have deepened this uncertainty ....[29]

The April Order goes on to indicate that "the Secretary of State shall object to any attempt by any other state or international organization to treat the Moon Agreement as reflecting or otherwise expressing customary international law."[30]

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[25] Jeff Foust, *NASA Announces Artemis Accords for International Cooperation in Lunar Exploration*, SPACENEWS (May 15, 2020). *See* Chris Borgen, *The Artemis Accords: One Small Step for Space Law?*, OPINIOJURIS, (May 8, 2020), https://opiniojuris.org/2020/05/08/the-artemis-accords-one-small-step-for-space-law/.

[26] Guoyu Wang, *NASA's Artemis Accords: the Path to a United Space Law or a Divided One?*, THE SPACE REVIEW (Aug. 24, 2020), https://www.thespacereview.com/article/4009/1.

[27] Artemis Accords, *supra* note 24, §10.

[28] April Executive Order, *supra* note 20, §2.

[29] *Id.* § 1, para. 2.

[30] *Id.* § 2.

This is a unilateral attempt to circumvent the Outer Space Treaty and general international law contravenes the *pacta sunt servanda* and good faith principles of international law. "A party may not unilaterally free itself from the engagements of a treaty, or modify the stipulations thereof, *except by the consent of the contracting parties*, through a friendly understanding."[31]

The Artemis Accords were executed by a number of "like minded" States and published on October 13, 2020.[32] The section relating to Space Resources provides:

> 1. The Signatories note that the utilization of space resources can benefit humankind by providing critical support for safe and sustainable operations.
>
> 2. The Signatories 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. The Signatories affirm that the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty, and that contracts and other legal instruments relating to space resources should be consistent with that Treaty.
>
> 3. The Signatories commit to informing the Secretary-General of the United Nations as well as the public and the international scientific community of their space resource extraction activities in accordance with the Outer Space Treaty.
>
> 4. The Signatories intend to use their experience under the Accords to contribute to multilateral efforts to further develop international practices and rules applicable to the extraction

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[31] CHENG, *supra* note 14, at 113 (emphasis added). *See* Vienna Convention, *supra* note 11, art. 31.

[32] *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 (last visited Oct. 21, 2020) [hereinafter Artemis Accords]. The current signatories are Australia, Canada, Italy, Japan, Luxembourg, Ukraine, the United Arab Emirates, the United Kingdom and the United States.

> and utilization of space resources, including through ongoing efforts at the COPUOS.[33]

The Accords are not agreed with all contracting parties to the Outer Space Treaty and so cannot change the legal effect of the Outer Space Treaty but might make it more uncertain to claim the Moon Agreement provisions as part of general international law. To do so would require showing that there is in relation to the relevant provisions an *opinio generalis juris generalis* (general legal opinion held generally).[34]

In the making of rules of general international law it is always the will of the dominant section that prevails, like in the making of all laws. In many ways, this is merely stating a truism; for those who are able to make their will prevail in a given situation must be reckoned *pro tanto* to be the dominant or prevailing section within that grouping, and conversely unless that section of society is able to make its legislative will prevail, it would not qualify as the dominant section. Basically, the dominant section consists of those who have the *capability*, the *intention*, and the *determination* of making their will prevail. Whilst, in general, those whose interests are specially affected, should be among those that accept the rule, yet in the end it is one's capability, intention, and will to uphold one's *opinio individual juris generalis* that count.[35]

Given that the Artemis Accords are not agreed by China, France, Germany, India or Russia it will be more difficult for the Accords' provisions to become part of international law. However, if other States parties to the Outer Space Treaty do not object to them there is a risk that the International Court of Justice would interpret Article II as restricted to State territorial claims and resource extraction. This is particularly so if the "like minded" parties are the major space-faring States. Such risk may be small given that China cannot be a party to the Artemis Program unless United States law is changed to allow its participation.[36]

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[33] *Id.* §10.

[34] CHENG, *supra* note 14, at 190.

[35] *Id.* at 183.

[36] Department of Defense and Full Year Continuing Appropriations Act 2011, Pub. L. No. 112-10, § 1340, 125 Stat. 38, 123.

> None of the funds made available by this division may be used for the National Aeronautics and Space Administration or the Office of Science and Technology

A limited interpretation of Article II would disadvantage States not parties to the Accords and unable to participate in any commercial benefits that might be gained.

MUNICIPAL LAW AND GENERAL INTERNATIONAL LAW

Two other factors need consideration. First, whether the 2015 Act, the April Executive Order or the Artemis Accords constitute a breach of international law by the United States. Second, if so, the time at which such breach occurs.

Municipal enactments are acts of State and can constitute violation of international law.[37] The 2015 Act provides:

> United States citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States.[38]

The United States expressly accepts its lack of sovereignty or sovereign or exclusive rights over celestial bodies.[39] Ownership requires the existence of the legal right to property under a sovereign.[40] Therefore, in granting ownership of space resources to United States citizens the 2015 Act extends the jurisdiction of the United States to asteroids and other celestial bodies.

It has been argued that any conflict between the 2015 Act and the Outer Space Treaty can be avoided by interpreting the Act as applying only to resources *already extracted*, leaving for future determination a legal regime for extraction.[41] Under this theory the

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> Policy 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 way with China or any Chinese-owned company unless such activities are specifically authorized by a law enacted after the date of enactment of this division.

Id.

[37] CHENG, *supra* note 14, at 174.

[38] 51 U.S.C. § 51303.

[39] U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, § 403.

[40] Morris Cohen, *Property and Sovereignty*, 13 CORNELL L. REV. 8, 11–12 (1927).

[41] 161 Cong. Rec. H3518–9 (2015). Entered into the record are portions of a letter dated May 15, 2015 from Henry Hertzfeld, Matthew Schaefer, James Bennett & Mark

United States is not extending its jurisdiction to outer space nor appropriating any part of outer space. Another argument advanced before Congress in support of the right to *extract* space resources cites the "One Lucite Ball"' case,[42] where the court upheld the right of Honduras to assert ownership over a Moon rock.[43] However, the point in issue was not before the court and no reference was made to Article II of the Outer Space Treaty.

As a solution to avoid United States sovereignty in outer space this argument has superficial merit. However, it relies on some other future regime to permit lawful extraction of space resources. In the absence of State sovereignty, creating title over the resource *in situ* requires the existence of a legal regime by virtue of an international treaty.[44] The Accords seek to remedy this by declaring "that the extraction of space resources does not inherently constitute national appropriation under Article II of the Outer Space Treaty . . . . "[45] However, one or a number of parties to a treaty cannot modify its stipulations without the consent of all contracting parties.[46]

But the intent of the 2015 Act is to "facilitate commercial exploration for and commercial recovery of space resources by United States citizens."[47] Without a legal regime permitting "recovery" or "extraction" of space resources the Act does not create the certainty for commercial exploitation of space resources sought by the United States.[48] Therefore, it remains uncertain whether space resources can be legally "extracted" and thereafter *obtained*. Any licensing or authorization regime devised by the United States permitting

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Sundahl which, among other things, states that the 2015 Act "does not, in any manner, claim sovereignty over a celestial body or portions of outer space; it only provides for rights for private entities to use the resources on a celestial body (specifically asteroids) just as States have in the past." *Id.* at H3518.

[42] *Id.*

[43] United States v. One Lucite Ball Containing Lunar Material, 252 F.Supp. 2d 1367 (S.D. Fla. 2003).

[44] For a discussion of the issues *see* Steven Freeland, *Common Heritage, Not Common Law: How International Law Will Regulate Proposals to Exploit Space Resources*, QUESTIONS OF INT'L L. 19 (2017).

[45] Artemis Accords, *supra* note 32, §10(2).

[46] Vienna Convention, *supra* note 9, art. 40.

[47] 51 U.S.C. § 51302(a)(1).

[48] April Executive Order, *supra* note 20, §1. It is worth noting that "commercial" activity can be conducted by the State or private entity. *See* SerVaas Incorporated v Rafidian Bank [2012] UKSC 40, http://www.bailii.org/uk/cases/UKSC/2012/40.html.

"extraction" would amount to the exercise of sovereignty over and appropriation of outer space and its resources.[49]

If "obtained" can be separated and distinguished from recovery or extraction in this context, it follows that other measures are required before the provisions of the 2015 Act come into practical effect. Whether an enactment constitutes violation of international law depends on what is prohibited and on whether the municipal law actually contravenes international law or merely enables some other organ of the State to do so. In the latter case the enactment is merely a preparatory act to a violation *in posse*, justifying only diplomatic representation. In the former case the unlawful act arises from the adoption of the enactment.[50]

The Executive Order articulates United States policy regarding space resources and directs certain executive actions to implement the policy. However, it is not of itself an act of State sufficient to breach international law.

It follows that if the 2015 Act does not permit appropriation and extraction of space resources, no breach of international law has yet occurred. Nevertheless, it is incumbent on parties to the Outer Space Treaty to represent their objections to the United States, Luxembourg and other States minded to subscribe to the requirements of the Artemis Accords. The 2017 Luxembourg Space Resources Act[51] declares that space resources can be appropriated, going further than the 2015 Act to permit appropriation of

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[49] NASA has released a solicitation for the collection and "an 'in-place' transfer of ownership of the lunar regolith or rocks to NASA." Jim Bridenstine, *Space Resources are Key to Safe and Sustainable Lunar Exploration*, NASA BLOG (Sep. 10, 2020), https://blogs.nasa.gov/bridenstine/2020/09/10/space-resources-are-the-key-to-safe-and-sustainable-lunar-exploration/; Christian Davenport, *NASA Announces it's Looking for Companies to Help Mine the Moon*, WASH. POST (Sep. 10, 2020), https://www.washingtonpost.com/technology/2020/09/10/moon-mining-nasa-search/?hpid=hp_hp-more-top-stories-2_moonmining-1240pm%3Ahomepage%2Fstory-ans. It is not clear how NASA envisages such ownership can exist so as to be transferred to NASA. If the United States government licenses the recovery of space resources, the license will be a breach of Article II of the Outer Space Treaty.

[50] CHENG, *supra* note 11, at 174.

[51] Loi 674 du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace [Law 674 of July 20, 2017 on the Exploration and Use of Space Resources], JOURNAL OFFICIEL DU GRAND-DUCHE DE LUX., July 28, 2017, http://legilux.public.lu/eli/etat/leg/loi/2017/07/20/a674/jo [hereinafter Luxembourg Space Resource Law]. This law appears to breach the Outer Space Treaty, Article II.

resources, extending Luxembourg sovereignty to outer space in breach of the Outer Space Treaty.

THE ARTEMIS ACCORDS

Rather than engage in modification or clarification of the Outer Space Treaty appropriation provisions through a friendly understanding with other parties,[52] it appears that through the Artemis Accords the United States is inviting *likeminded* States to join in freeing themselves of the appropriation prohibitions of the Outer Space Treaty, declaring that "space resource extraction and utilization *can and will* be conducted . . ."[53]

The provisions of the Accords relating to space resources is a retrograde step undermining the Outer Space Treaty, the Moon Agreement and the work of the United Nations Committee on Peaceful Uses of Outer Space as the forum for international discussion and agreement on outer space. The Accords can only breed international discord among the international community.

The ambitions articulated in the Accords and the underlying proprietary interests being promoted raise concerns as to potential militarization of space. Combined with the statements that space is a "war-fighting domain"[54] other States may reasonably fear exclusion from parts of outer space to protect commercial interests in space resources.

CONCLUSION

Although the matters addressed here do not of themselves alter international law, they have the potential to create discord, friction and conflict. It would be in the interest of both the international community and the United States and Luxembourg to engage more widely in agreeing amendments or protocols to the Outer Space Treaty at the international level. The United States demonstrated

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[52] CHENG, *supra* note 11, at 113.

[53] *The Artemis Accords,* NASA, https://www.nasa.gov/specials/artemis-accords/index.html#:~:text=International%20space%20agencies%20that%20join,which%20facilitates%20exploration%2C%20science%2C%20and (last visited July 12, 2020)(emphasis added).

[54] Cecelia Smith-Schoenwalder, *Pence: Space is a War-Fighting Domain*, USNEWS, (May 6, 2019), https://www.usnews.com/news/national-news/articles/2019-05-06/mike-pence-space-is-a-war-fighting-domain.

the benefits of dialogue and co-operation with terrestrial adversaries in the Apollo-Soyuz test project in the 1970s.

It is also worth remembering that the Outer Space Treaty came about by the recognition by the United States and the Soviet Union the value of international involvement and acceptance of principles that have served us so well, ably analyzed and articulated by Bin Cheng.

SAFETY ZONES: A NEAR-TERM LEGAL ISSUE ON THE MOON

Jack Wright Nelson[*]

I. INTRODUCTION

International space law attributes no special status to the area surrounding a lunar installation.[1] Despite this lack of recognition, the Artemis Accords – recently adopted by the United States (US) National Aeronautics and Space Administration (NASA) and its international partner agencies – contemplate the establishment of buffer areas around lunar installations.[2] Accordingly, the legality of these areas, referred to as "safety zones,"[3] is a near-term issue in international space law.

This paper aims to place safety zones in their legal context. First, this paper explores the position of safety zones under the

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[1] Leslie I. Tennen, *Enterprise Rights in Extraterrestrial Resources: Commentary on Outer Space and International Geography: Article II and the Shape of Global Order*, 52 NEW ENG. L. REV. 139, 148 (2018) ("None of the provisions of the *corpus juris spatialis* pertaining to the establishment of facilities and stations on celestial bodies include a right to claim exclusive occupation of an area forming a perimeter around the structure.").

[2] *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 (last visited Oct. 15, 2020) [hereinafter Artemis Accords]. The current signatories are Australia, Canada, Italy, Japan, Luxembourg, Ukraine, the United Arab Emirates, the United Kingdom and the United States.

[3] These buffer areas have also been called "keep-out zones." *See* F. Kenneth Schwetje, *Protecting Space Assets: A Legal Analysis of "Keep-Out Zones"*, 15 J. SPACE L. 131 (1987). The author has also heard them referred to as "avoidance zones" or "control zones." In line with the Artemis Accords, this paper will only use the term "safety zone." *See* THE HAGUE INT'L SPACE RES. GOVERNANCE WORKING GRP., BUILDING BLOCKS FOR THE DEVELOPMENT OF AN INTERNATIONAL FRAMEWORK ON SPACE RESOURCE ACTIVITIES ¶ 8 (2019), https://www.universiteitleiden.nl/binaries/content/assets/rechtsgeleerdheid/instituut-voor-publiekrecht/lucht—en-ruimterecht/space-resources/bb-thissrwg—cover.pdf; Artemis Accords, *supra* note 2.

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).[4] Second, it leverages internationally-recognized air and space law expert Bin Cheng's conceptualization of jurisdiction[5] to analyze the type of jurisdiction that States may exercise in these zones.

This paper concludes that while safety zones are supported by the Outer Space Treaty, the jurisdiction that applies over a safety zone is a limited, personal jurisdiction. Finally, this paper discusses the way forward for safety zones by reference to key precedents, commercial considerations and interim confidence-building measures.

II. SAFETY ZONES AND THE OUTER SPACE TREATY

The exact parameters of safety zones will invariably differ between lunar installations. The Artemis Accords state that "the nature of … operations" and "the environment that such operations are conducted in" will inform the "size and scope" of safety zones – and that, among signatories, prior "notification and coordination" is required before conducting operations in these zones.[6] The Artemis Accords do not specify what exactly notification and coordination requires. But the parameters in these zones could include advance travel plan filings combined with deviation notifications. Maximum speeds may be established, as well as minimum separations from lunar installations or equipment. Rocket engine operations may be prohibited. Radio-interference may need to be minimized.

Regardless of the exact parameters, the core tenet of the safety zone concept is that particular lunar areas will require particular management in order to deconflict lunar activities. For safety reasons, such zones will become necessary as lunar activities expand. But doubt persists that safety zones can comply with fundamental

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

[5] *See generally* BIN CHENG, STUDIES IN INTERNATIONAL SPACE LAW 72–80 (1997).

[6] Artemis Accords, *supra* note 2, §§ 7-10.

space law principles established in Articles I and II of the Outer Space Treaty.[7]

Accordingly, the question arises: are safety zones compatible with the Outer Space Treaty? In order to locate safety zones within this legal framework, this section explores Articles I and II of the Outer Space Treaty. The analysis then turns to Article IX of the Outer Space Treaty. The Artemis Accords identify this Article as providing the core legal foundation for safety zones. The conclusion reached is that safety zones are not precluded by Articles I and II. Moreover, support for their establishment can be found in Article IX. These same Articles, however, will also impose restrictions on the possible parameters of safety zones.

A. Article I

Article I of the Outer Space Treaty states that the Moon is "free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas" of the Moon.[8]

A safety zone established by a State may breach Article I if it prevents other States from exercising their Article I freedoms of exploration, use and access. For example, consider a State that declares a safety zone around a lunar installation that is registered by that State. This safety zone purports to prohibit all entry, except with the permission of the declaring State. Establishing this safety zone could fall under the declaring State's freedom of use. But the parameter that prohibits entry clearly limits other States' Article I freedoms of exploration, use and access (among other rights). Does this mean that the declared safety zone violates Article I?

Not necessarily. Such a zone would be readily contestable. But a safety zone can limit the exercise of Article I freedoms without itself breaching Article I. This is because Article I must be read in light of the Outer Space Treaty's other provisions.[9] This broader

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[7] *See, e.g.*, Kiran Vazhapully, *Space Law at the Crossroads: Contextualizing the Artemis Accords and the Space Resources Executive Order*, OPINIO JURIS (July 22, 2020), http://opiniojuris.org/2020/07/22/space-law-at-the-crossroads-contextualizing-the-artemis-accords-and-the-space-resources-executive-order/.

[8] Outer Space Treaty, *supra* note 4, art. I.

[9] Vienna Convention on the Law of Treaties art. 31(1), May 23, 1969, 1155 U.N.T.S. 331 [hereinafter Vienna Convention].

context shows that the Article I freedoms are qualified by other provisions of the Outer Space Treaty.[10] For example, Article XII provides for visitation rights between lunar installations. These rights are on the basis of reciprocity. Exercise of these rights also requires "reasonable advance notice."[11] The necessary implication is that there is no free visitation right to lunar installations. This is so despite Article I's statement purportedly mandating "free access to all areas" of celestial bodies. Article XII, therefore, qualifies the Article I freedom of access.[12]

Accordingly, that a safety zone limits Article I freedoms is not sufficient to render that safety zone non-compliant with Article I. However, Article I does impose restrictions on the parameters of safety zones. The words "on a basis of equality" mean that a State's exercise of its Article I freedoms must "take into account the corresponding freedoms of other States" – and the Artemis Accords specifically commit signatories to "respect[ing] the principle of free access to all areas of celestial bodies."[13] How these restrictions will work in practice remains to be seen. Indeed, the applicability of these restrictions will depend, at least in part, on the extent of lunar activities at a given point in time.

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[10] CHENG, *supra* note 5, at 402 ("The exercise of the right of free access is thus in certain cases subject to conditions.").

[11] This is in contrast to the Antarctic Treaty art. VII, Dec. 1, 1959, 12 U.S.T. 794, 402 U.N.T.S. 71 of which provides that "[a]ll areas of Antarctica, including all stations, installations and equipment within those areas, and all ships and aircraft at points of discharge or embarking cargoes or personnel in Antarctica, shall be open at all times to inspection by any observers designated in accordance with paragraph 1 of this Article." CHENG, *supra* note 5, at 249-50.

[12] Harrington notes that the effect of Article VIII of the Outer Space Treaty is that "[w]hile exclusivity is not permitted with regard to land, exclusivity can be exercised with regard to stations and facilities." *See* Andrea J. Harrington, *Preserving Humanity's Heritage in Space: Fifty Years after Apollo 11 and Beyond*, 84 J. AIR L. & COM. 299, 321 (2019). The impact of Article VIII is addressed in the third section of this Article.

[13] Philip De Man, *Rights Over Areas vs Resources in Outer Space: What's the Use of Orbital Slots?* 38 J. SPACE L. 39, 56 (2012); Artemis Accords, *supra* note 2, § 11. Other provisions of the Outer Space Treaty impose similar restrictions. For example, Article IX states that in "the exploration and use" of the Moon, States Parties to the Outer Space Treaty "shall be guided by the principle of co-operation and mutual assistance." *Id.* at art. IX.

B. Article II

Article II of the Outer Space Treaty states that the Moon "is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means."[14] This principle of non-appropriation is fundamental to international space law.[15] Safety zones could amount to the *de facto* appropriation of the lunar surface,[16] particularly if established for prolonged periods.[17] However, as with Article I, the non-appropriation principle must be read in the context of the Outer Space Treaty's other provisions. In particular, Article XII of the Outer Space Treaty uses the words "station" and "installation." The ordinary meaning of these terms entails a prolonged occupation. Accordingly, as Cheng notes, the Outer Space Treaty cannot preclude prolonged occupations of those parts of the lunar surface that lie underneath lunar installations.[18] Indeed, the *de facto* appropriation of those parts is, more or less, unavoidable.[19]

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[14] Outer Space Treaty, *supra* note 4, art. II.

[15] *See* CHENG, *supra* note 5, at 188.

[16] Harrington raises similar concerns in respect of human heritage in outer space. She states that "the concern with regard to heritage destined for *in situ* preservation on a celestial body [is that] it will result in perpetual occupation of the surface on which the heritage rests." *See* Harrington, *supra* note 12, at 320.

[17] *See* CHENG, *supra* note 5, at 401 ("However, even though appropriation, whether by States or by individuals, of parts of outer space and of celestial bodies is prohibited, if any part thereof, especially in the case of celestial bodies, is subjected to prolonged occupation, for instance, for the purpose of exploitation, complicated legal problems are bound to arise."). *See also* OGUNSOLA O. OGUNBANWO, INTERNATIONAL LAW AND OUTER SPACE ACTIVITIES xvi (1975) ("Above all, the designation of zones could be in conflict with Article II of the [Outer] Space Treaty – by virtue of which outer space and celestial bodies are not susceptible to appropriation by States."). The Artemis Accords clarify that safety zones will "ultimately be temporary, ending when the relevant operation ceases." Artemis Accords, *supra* note 2, § 7(c).

[18] CHENG, *supra* note 5, at 401 Cheng explains that prolonged occupation arising from exploration or use of celestial bodies "can easily come into conflict with the 'free access' principle which is inherent in the concept of non-appropriation and res extra commercium and which is re-affirmed in Article I(2)." Cheng continues, noting that this problem is complicated by the "lack of clear precedents, inasmuch as the position on land in somewhat different from that on the high seas." He concludes that "some such occupation is not precluded by [Article II] can be seen from Article XII."

[19] The Moon Agreement implicitly recognizes this by stating that the "placement of personnel, space vehicles, equipment, facilities, stations and installations on or below the surface of the Moon . . . shall not create a right of ownership over the surface . . . of the Moon." *See* Agreement Governing the Activities of States on the Moon and Other Celestial Bodies art. 11(3), Dec. 18, 1979, 1363 U.N.T.S. 22.

Recognizing this reality, Harrington posits that "[i]n order to constitute appropriation [under Article II], both elements of factual possession and intention to possess would have to be met."[20] The requirement for both factual possession and intention to possess aligns with general international law, as extended to the Moon by Article III of the Outer Space Treaty.[21] Accordingly, in the absence of intention to possess, a safety zone may result in factual possession without breaching Article II.

Like Article I, however, Article II will impose restrictions on safety zones. In particular, periodic disclaimers of any intention to claim or possess a portion of the Moon would not cure Article II issues that may arise from a prolonged occupation. Rather, the actual acts undertaken in respect of that occupation would need to be assessed. For example, Cheng notes that Article II means that no State can exercise a "territorial jurisdiction" on the Moon.[22] Exercising such a jurisdiction on the Moon within a declared safety zone would likely evince both factual possession and intention to possess, regardless of disclaimers to the contrary. Accordingly, a safety zone must not indicate a territorial jurisdiction. For example, a safety zone should not generally be enclosed within a fence, or otherwise made to resemble an international boundary. No charges could be levied in respect of entering a safety zone. No part of a safety zone could be leased or licensed. Such actions would indicate the exercise of a territorial jurisdiction and, thereby, an intention to claim or appropriate lunar territory in contravention of Article II.

C. Article IX

Article IX states that a State Party to the Outer Space Treaty must "undertake appropriate international consultations" before proceeding with a lunar activity or experiment that is planned by it or its nationals, if that State Party has "reason to believe" that the activity or experiment "would cause *potentially harmful*

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[20] Harrington, *supra* note 12, at 320.

[21] *See* Legal Status of Eastern Greenland (Den. v. Nor.), Judgement, 1933 P.C.I.J. (ser. A/B) No. 53, at 45-46 (Apr. 5) (finding that claims to sovereignty based not on title or acts, but on "continued displays of authority," require proof of two elements, namely "the intention and will to act as sovereign, and some actual exercise or display of such authority").

[22] CHENG, *supra* note 5, at 400. The implication for jurisdiction over safety zones is discussed in the next section of this Article.

interference with activities of other States Parties in the peaceful exploration and use of . . . the Moon."[23]

This same Article also states that States Parties to the Outer Space Treaty must "conduct all their activities [on] . . . the Moon . . . *with due regard* to the corresponding interests of all other States Parties to the Treaty"[24] The Artemis Accords rely on Article IX to support the establishment of safety zones.[25] While the link between safety zones and Article IX is not immediately apparent, there are two key aspects to this connection, as described below.

First is the concept of "potentially harmful interference." A State could declare a safety zone around a lunar installation and then declare that entering the safety zone would harmfully interfere with the lunar installation's activities. Other States Parties contemplating activities within the declared safety zone would then have "reason to believe" that those activities "would cause potentially harmful interference" with the declaring State's activities. Under Article IX, those States Parties must undertake consultations before proceeding with the contemplated activities. Importantly, consultation requires notification. Accordingly, Article IX can support safety zones to the extent that they involve notification requirements (as is the case under the Artemis Accords).

Second is the principle of due regard—a principle that is not unique to international space law.[26] As Ram Jakhu, an international space law expert at McGill University, explains, due regard reiterates a rule of general international law that amounts to "respect[ing] . . . the rights of others."[27] The boundaries of this principle are not fixed. But a corollary is that a State must consider "the

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[23] Outer Space Treaty, *supra* note 4, art. IX (emphasis added).

[24] *Id.* (emphasis added).

[25] Artemis Accords, *supra* note 2, § 3:

> Consistent with Article IX of the Outer Space Treaty, a Signatory authorizing an activity under these Accords commits to respect the principle of due regard. A Signatory to these Accords with reason to believe that it may suffer, or has suffered, harmful interference, may request consultations with a Signatory or any other Party to the Outer Space Treaty authorizing the activity.

Id.

[26] *See, e.g.*, Chicago Convention on International Civil Aviation art. 3(d), Dec. 7, 1944, 15 U.N.T.S. 295; Convention on the Law of the Sea art. 87(2), Dec. 10, 1982, 1833 U.N.T.S. 397.

[27] Ram S. Jakhu, *Legal Issues Relating to the Global Public Interest in Outer Space*, 32 J. SPACE L. 31, 48 (2006).

legitimate special interests of other States" when it exercises "its freedom of action."[28] The safety of a lunar installation is likely a legitimate special interest. Accordingly, due regard could entail respecting the measures that a State adopts to ensure the safety of its lunar installations and personnel—for example, by engaging in coordination mechanisms established by the State declaring the safety zone.

In this manner, the Artemis Accords seek to operationalize Article IX in support of safety zones. Yet the Article IX obligations are of a "somewhat indefinite character."[29] Importantly, only consultations are expressed to be mandatory under Article IX. Accordingly, it is unlikely that Article IX could be relied upon to preclude *any* activity within a declared safety zone.[30] However, the incorporation of the due regard principle ensures that Article IX remains responsive to actual conditions on the Moon. Accordingly, the support that Article IX can provide for States looking to establish safety zones is not necessarily limited; enforcement of such zones, however, raises questions of jurisdiction that are discussed in the following section.

III. QUESTIONS OF JURISDICTION

The Outer Space Treaty provides the key legal framework for safety zones. But what is the nature of the jurisdiction that a State can exercise over a safety zone? The Artemis Accords do not address this issue. Accordingly, this section leverages Cheng's conceptualization of jurisdiction to answer this question. The conclusion reached is that only a limited, personal jurisdiction is exercisable in respect of a safety zone.

A. Types of Jurisdiction

Cheng identifies three types of jurisdiction: personal, quasi-territorial and territorial.[31] As there is no territorial sovereignty in

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[28] *Id.* at 48.

[29] CHENG, *supra* note 5, at 256.

[30] *See* Harrington, *supra* note 12, at 339 (commenting in the context of lunar heritage preservation that "[t]hrough only the consultations are mandatory, and thus the activity itself is not halted by this rule, [Article IX] provides an important pause in the process to consider potential damage not only to space heritage but also to relations between states.").

[31] CHENG, *supra* note 5, at 72–73.

outer space or on celestial bodies, this paper will only consider personal and quasi-territorial jurisdiction.

Personal jurisdiction is "the sum total of the powers of a State in respect of individuals or corporate bodies or business enterprises having its nationality or otherwise enjoying its protection or owing it allegiance, wherever they may be."[32] There are also certain extraordinary types of jurisdiction. These have primarily developed in the field of international criminal law.[33] Under Cheng's conceptualization of jurisdiction, these extraordinary types of jurisdiction are species of personal jurisdiction.[34] This is because these extraordinary jurisdictions are founded on the nationality, position or activities of the persons involved. They do not depend on the existence of a territorial or quasi-territorial jurisdiction. Nor do they entail supervision and control, which are hallmarks of territorial or quasi-territorial jurisdictions.

Quasi-territorial jurisdiction is "the sum total of the powers of a State in respect of ships, aircraft and spacecraft (to the extent to which they are also granted legal personality) having its nationality or registration."[35] The key difference between personal jurisdiction and quasi-territorial jurisdiction is that the former "extends not only to the craft in question but also to all persons and things on board, including the activities of such persons, whether on board the craft or elsewhere."[36]

B. Elements of Jurisdiction

Each type of jurisdiction is further divisible into two elements: jurisfaction and jurisaction. The two elements have an internal hierarchy: "[t]he validity of jurisaction presupposes jurisfaction, but it is possible to have jurisfaction without jurisaction."[37] Both elements are described below.

Jurisfaction is "the normative element of State jurisdiction . . . being the legal power recognized in international law to make

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[32] *Id.* at 73.

[33] *Id.* at 306.

[34] *See, e.g.,* CHENG, *supra* note 5, at 73 (referring to pirates coming "under the extraordinary personal jurisdiction of all States").

[35] *Id.*

[36] *Id.*

[37] *Id.* at 136.

laws, render judicial pronouncements, and adopt other decisions with legally binding force."[38] The essence of this power, where a State enjoys it, is that the norms so established under it are recognized by international law as lawful, valid and hence applicable. Jurisfaction tends to be cosmographical in scope.

Jurisaction is "the concrete or physical element of State jurisdiction . . . being the legal power recognized in international law actually to set up machinery to make, implement and enforce, and physically to make, implement and enforce its laws, judicial pronouncements, and other legally binding decisions."[39]

C. Jurisdictional Hierarchy

Cheng's conceptualization of jurisdiction includes an internal hierarchy of jurisactions:

> [i]n order to avoid any conflict of jurisactions, which can almost be said to be its prime function, international law, in addition to delimiting areas of State competence spatially as we have described above, establishes a hierarchy among the three types of jurisactions, whenever they overlap, with territorial jurisaction overriding both quasi-territorial and personal jurisactions, and quasi-territorial jurisaction overriding personal jurisaction.[40]

By contrast, jurisfactions can co-exist. This is because they are normative. As such, there is no immediate conflict between jurisfactions. For example, there is no conflict when an Egyptian boards an Indian aircraft in Japan, despite the fact that the Egyptian is subject at that time to jurisfaction of Egypt (personal), India (quasi-territorial) and Japan (territorial). The right of each State to make laws that will affect the Egyptian, on the grounds of nationality (in the case of Egypt), quasi-territorial jurisdiction (in the case of India) or territorial jurisdiction (Japan) is clear. But the same does not apply in respect of jurisactions. Neither an Egyptian nor an Indian police officer would be entitled to board the plane and arrest the Egyptian passenger while the plane was sitting on the tarmac in

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[38] *Id.* at xlviii.

[39] *Id.* at xlviii.

[40] CHENG, *supra* note 5, at 388.

Japan.[41] The jurisaction in this example would belong exclusively to Japan, as the jurisactions of Egypt and India would be superseded by that of Japan.

D. Jurisdiction on the Moon

Cheng's conceptualization of jurisdiction provides insight into the nature and extent of a State's jurisdiction on the Moon. Article VIII of the Outer Space Treaty is the key touchpoint here.[42] This Article states that "[a] State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body."[43]

The word "thereof" is of particular importance. As Cheng explains, this word was a deliberate insertion to make it clear that the jurisdiction granted under Article VIII covered the personnel of a spacecraft both inside and outside the spacecraft.[44] Accordingly, a Japanese member of an Egyptian-registered lunar installation will be subject to Egyptian—and not Japanese—jurisdiction anywhere on the lunar surface.[45] The fact that Egyptian jurisdiction prevails is a clear illustration that the "jurisdiction referred to in Article VIII is quasi-territorial rather than personal."[46] If it were otherwise, there would a conflict between the two personal jurisdictions.

Visits between lunar installations present more complex jurisdictional questions. To extend the example above, which State has

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[41] *Id.* at 137 (explaining that "personal jurisaction may, however, be exercised from outside spheres of territorial or quasi-territorial jurisaction of other States. This has the effect, of course, of restricting such exercise of personal jurisaction to only its legislative and judicial form and of excluding executive jurisaction. In practical terms, this means that a State may, in its own territory, pass laws applicable to its own nationals who are in foreign countries, or on board foreign craft that are not in its own territory, and even try them in absentia, but it may not send its officers to where they are in order to arrest them.").

[42] The Registration Convention also addresses jurisdiction but only expands Article VIII with respect to joint launches. *See* Convention on Registration of Objects Launched into Outer Space art. II(2), Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

[43] Outer Space Treaty, *supra* note 4, art. VIII.

[44] CHENG, *supra* note 5, at 232.

[45] *See id.* [46] *Id.* at 231.

[46] *Id.* at 231.

jurisdiction if the Japanese member of the Egyptian-registered lunar installation enters an Indian-registered lunar installation? As above, Japan's personal jurisdiction over its national is superseded by Egypt's quasi-territorial jurisdiction over its lunar installation and its personnel. But India also has a quasi-territorial jurisdiction over its own lunar installation. This can lead to conflict should both Egypt and India attempt to exercise jurisaction.

Cheng raises, but does not answer, this same question.[47] Nor do the *travaux préparatoires* resolve the issue.[48] But as George Kyriakopoulos and Maria Manoli explain, Article VIII does not extinguish other types of jurisdiction.[49] Accordingly, a potential solution is to recognize that Egypt's quasi-territorial jurisdiction does not extend *inside* the Indian lunar installation, regardless of the presence of the Japanese crewmember within that installation. Rather, Egypt's quasi-territorial jurisdiction subsists based on Article VIII, just as Japan's personal jurisdiction subsists based on the crewmember's nationality.

Support for this proposition can be found by referring to the object and purpose of the Outer Space Treaty.[50] To this end, Ogunsola Ogunbanwo notes that "the paramount aim of the drafters"

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[47] *Id.* at 625.

> In that case, among the unresolved problems is that of the status, for instance, of a member of one space station visiting another space station registered in a different State. Will he remain under the jurisdiction of the State of registry of the space object to which he belongs, or will he come under the jurisdiction of the State of registry of the space object which he is visiting? Under the traditional concept of nationality of ships and aircraft, the quasi-territorial jurisaction of the vehicle will override the personal jurisaction of the national State of the astronaut. Under the Space Treaty, the personnel of a space object is seemingly said to remain, while a personnel of that space object, under the jurisaction of its State of registry, even when he is on board a spacecraft registered in another State. Is this so?

Id.

[48] Rather, the Canadian and Soviet representatives only envisaged the change to "personnel thereof" as ensuring that the State of registry retained jurisdiction and control over personnel both "inside and outside" the object: see U.N. Comm. on the Peaceful Uses of Outer Space, Legal Sub-Comm., *Summary Record of the Sixty-Sixth Meeting*, U.N. Doc. A/AC.105/C.2/SR.66 at 11 (Oct. 21, 1966).

[49] GEORGE D. KYRIAKOPOULOS & MARIA MANOLI, THE SPACE TREATIES AT CROSSROADS: CONSIDERATIONS DE LEGE FERENDA 81 (2019) (explaining that Article VIII does not extinguish other types of jurisdiction).

[50] Vienna Convention, *supra* note 9, art. 31(1).

was "the maintenance of law and order with regard to the operation of spacecraft whether in outer space or on a celestial body."[51]

Accordingly, a strong argument here is that the Egyptian quasi-territorial jurisdiction ends at the walls of the Indian lunar installation, because a contrary interpretation of Article VIII would unreasonably impinge the "jurisdiction and control" that India retains under that Article. On balance, this appears to be the better view. But in the absence of clarity either way, visits between lunar installations may require bespoke agreements as to jurisdiction.[52]

E. Discussion

As demonstrated above in the examination of international outer space law, various principles of international law may be used to justify a lunar safety zone. In each case, these principles largely amount to the same thing: the exercise of quasi-territorial jurisdiction. Three such justifications are described and analyzed below.

First, Dr. Imre Anthony Csabafi posits that a State can exercise a "functional jurisdiction" on the Moon.[53] This jurisdiction allows States to "regulate rights of persons, to affect property, things, events and occurrences in designated zones" on the Moon "to the extent necessary to safeguard and secure its right to explore and exploit outer space including celestial bodies."[54] Second, as German jurist Adrian Bueckling posits, a State of registry's jurisdiction over a lunar installation should extend to the "operation and supply area" around that installation.[55] The justification for this is considerations of operational requirements and "the circumstance of actual effectivity."[56] Third, as F. Kenneth Schwetje (then-Chief of Air and Space Law for the United States Air Force JAG Corps) notes, safety zones are compatible with international law on various

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[51] OGUNBANWO, *supra* note 17, at 81.

[52] This was the approach taken in respect of criminal jurisdiction on the ISS. *See* Hans P. Sinha, *Criminal Jurisdiction on the International Space Station*, 30 J. SPACE L. 85 (2004).

[53] IMRE ANTHONY CSABAFI, THE CONCEPT OF STATE JURISDICTION IN INTERNATIONAL SPACE LAW: A STUDY IN THE PROGRESSIVE DEVELOPMENT OF SPACE LAW IN THE UNITED NATIONS 131 (1971).

[54] *Id.* at 131.

[55] Adrian Bueckling, *The Formal Legal Status of Lunar Stations*, 1 J. SPACE L. 113, 117 (1973).

[56] *Id.* at 117.

grounds, including by differentiating between assertions of sovereignty and of jurisdictional competence. He concludes that safety zones, subject to constraints of reasonableness and reciprocity, are "appropriate non-aggressive uses of the space environment" that "are permitted as long as no claim of exclusive use is based on sovereignty."[57]

All these arguments extend the quasi-territorial jurisdiction that a State enjoys with respect to its lunar installation(s) and its personnel. The extension is to the area surrounding the installation. This is because the jurisdictions described by Csabafi, Bueckling and Schwetje involve controlling all persons and property that enter the safety zone. As Bueckling summarizes, the core contention is that a lunar installation and its immediate surroundings should share the same "legal destiny"[58] – that is, a quasi-territorial jurisdiction.

But extending a State's quasi-territorial jurisdiction beyond its lunar installations and their personnel would distort Article VIII. The plain language of Article VIII does not support such an extension. Further, granting a quasi-territorial jurisdiction could lead to conflicting jurisactions.

Consider, for example, the position of an Egyptian astronaut onboard an Indian lunar lander. The Indian lunar lander touches down in a safety zone that has been declared by Japan around a Japanese-registered lunar installation. If we accept that Japan can exercise a quasi-territorial jurisdiction over the declared safety zone, the Egyptian astronaut is subject to the jurisdiction of Egypt (personal), India (quasi-territorial) and Japan (quasi-territorial).

Breaking these jurisdictions down into their constitutive elements, there is no conflict of juris*factions*, as they can co-exist. However, the juris*actions* of India and Japan risk conflict. This is because both jurisactions would derive from a quasi-territorial jurisdiction.

Conflict would arise if, for example, Japan tried to arrest the Egyptian astronaut. In this scenario, Japan's exercise of jurisaction would infringe India's Article VIII rights with respect to the lunar lander and its personnel. This is because "[a]ny attempt to exercise jurisaction in outer space or on celestial bodies in excess of these

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[57] Schwetje, *supra* note 3, at 141.

[58] Bueckling, *supra* note 55, at 117.

limits will be an infringement of the right of either the flag-State or the national State of the individual, as the case may be, and a violation of international law."[59] This indicates that Japan's jurisdiction over the declared safety zone cannot be a quasi-territorial jurisdiction.

This conclusion is supported by consideration of other provisions of the Outer Space Treaty.[60] In particular, if a State could exercise a quasi-territorial jurisdiction over a safety zone, then the application of Article VI of the Outer Space Treaty becomes problematic. This Article states that "[t]he activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty."[61] Yet the nature of authorizing and continually supervising implies either a territorial or quasi-territorial jurisdiction. In the case of the Moon, Article VI can only imply a quasi-territorial jurisdiction. Accordingly, the "appropriate State Party to the Treaty" [62] for Article VI purposes will be the State Party that exercises a quasi-territorial jurisdiction over the relevant activities.[63] Typically, this would be the State of registry.

Establishing the kind of safety zone advocated by Csabafi, Bueckling and Schwetje, however, could result in the State declaring such a safety zone becoming the appropriate State Party to authorize and continually supervise the activities of non-governmental activities within that safety zone. This result is unreasonable. Returning to the scenario described above, let us assume that the Indian lunar lander is owned and operated by a non-governmental entity, with India as the State of registry. Upon entering Japan's declared safety zone, Japan would need to subject the lunar lander to its authorization and continuing supervision. And that would be

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[59] CHENG, *supra* note 5, at 142.

[60] As is required under the Vienna Convention, which states that, "[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." Vienna Convention, *supra* note 9, art. 27.

[61] Outer Space Treaty, *supra* note 4, art. VI.

[62] *Id.*

[63] *Cf.* Cestmir Cepelka & Jamie H.C. Gilmour, *The Application of General International Law in Outer Space*, 36 J. AIR L. & COM. 30, 35 (1970) (arguing that the jurisdiction retained under Article XIII is personal in nature.)

despite the fact that the lunar lander would only appear on the Indian national register.[64]

This discussion indicates that, longstanding arguments to the contrary notwithstanding, there is no quasi-territorial jurisdiction over a safety zone. Given that there is no territorial jurisdiction on the Moon, the jurisdiction that does apply over a safety zone (if any) would be personal in nature. This interpretation also aligns with the characterization of extraordinary jurisdictions as species of personal jurisdiction. To that end, the "functional jurisdiction" proposed by Csabafi may well exist[65] and support safety zones. But it cannot extend the quasi-territorial jurisdiction retained under Article VIII beyond lunar installations and their personnel.

Accordingly, any extraordinary jurisdiction that a State could exercise over a safety zone is personal only. While a safety zone may extend the scope of a State's personal jurisdiction to encompass persons and objects within the safety zone, the end result appears to be that, in law, a State does not enjoy a greater jurisdiction within a safety zone than that which it enjoys generally on the lunar surface.

The key practical impact of this finding is that a State declaring a safety zone could not exercise jurisdiction over the personnel of other lunar installations that happen to enter the declared safety zone.[66] Nor could the declaring State exercise jurisdiction over a lunar rover – or other registered space objects – that enter the declared safety zone. In both cases, the declaring State's personal jurisdiction would be superseded by the quasi-territorial jurisdiction that the relevant State of registry would retain under Article VIII.[67]

IV. THE WAY FORWARD

To explore the way forward for safety zones, this section considers the key precedents, highlights the commercial considerations and suggests interim, confidence-building measures.

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[64] The Outer Space Treaty makes no provision for dual registration.

[65] CSABAFI, *supra* note 53, at 131.

[66] Unless of course, the declaring State was also the State of registry for those other lunar installations.

[67] The interesting case of non-registered space objects on the Moon is not addressed here for reasons of length. *See* CHENG, *supra* note 5, at 625.

There are four key precedents that may inform the development of safety zones. First, in outer space, NASA, in agreement with its partners, has established specific operational zones to ensure the safety of the International Space Station (ISS).[68] Second, with respect to the Moon, NASA has published a non-binding set of recommendations relating to the preservation of lunar heritage (NASA Recommendations).[69] One of the recommendations relates to "exclusion zones" around space objects currently on the Moon that derive from the Apollo program and other US lunar missions.[70] Third, over the high seas, various States have established and enforced air defense identification zones (ADIZ).[71] Fourth, in Antarctica, specially managed areas have been established under the Antarctic Treaty system.[72]

These four precedents show that establishing particular zones in areas outside of State sovereignty is known within international law. With the exception of ADIZs, these zones have been largely uncontroversial. And while ADIZs have attracted opposition, they have largely been accepted, at least for commercial air traffic.[73] On the whole, the limited State practice appears to accept zones that are reasonable and prudent, in the recognition that they may promote safety or other defined objectives.

Overall, these precedents offer limited guidance for determining the way forward for safety zones. This is because they are either established pursuant to dedicated regimes (in the case of the ISS and the Antarctica Treaty), expressly stated to be non-binding

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[68] First, the "approach ellipsoid," extends 4km x 2km x 2km from the center of the ISS. Second, the 200m radius "keep-out sphere" surrounds the ISS. *See* Yazhong Luo, Jin Zhang & Guojin Tang, *Survey of Orbital Dynamics and Control of Space Rendezvous*, 27 CHINESE J. AERONAUTICS 1, 7 (2014).

[69] NASA, NASA'S RECOMMENDATIONS TO SPACE-FARING ENTITIES: HOW TO PROTECT AND PRESERVE THE HISTORIC AND SCIENTIFIC VALUE OF U.S. GOVERNMENT LUNAR ARTIFACTS (July 20, 2011), https://history.nasa.gov/alsj/617743main_NASA-USG_LUNAR_HISTORIC_SITES_RevA-508.pdf [hereinafter NASA Guidelines].

[70] *Id*. at 9. *See also* Artemis Accords, *supra* note 2, § 9.

[71] *See generally* Peter A. Dutton, *Caelum Liberum: Air Defense Identification Zones Outside Sovereign Airspace*, 103 AM. J. INT'L L. 691 (2009).

[72] *See Protecting and Managing Special Areas*, AUSTRALIAN ANTARCTIC PROGRAM, https://www.antarctica.gov.au/environment/protecting-and-managing-special-areas/ (last visited Oct. 19, 2020).

[73] This is attributed to light burden that they impose. *See generally* Jinyuan Su, *The Practice of States on Air Defense Identification Zones: Geographical Scope, Object of Identification, and Identification Measures*, 18 CHINESE J. INT'L L. 812 (2019).

(NASA lunar heritage zones), or themselves of uncertain legal status (ADIZs). There is also the danger, as identified by Ogunbanwo, of "rigidly assimilating the treatment accorded to shipping and aircraft to outer space activities."[74] Ultimately, the profoundly different environments of outer space and each celestial body will necessitate novel solutions to novel problems.

The future development of safety zones will need to address commercial interests. The days when space activities were driven solely by States are long gone. But, as Cheng notes, "[t]he main thing for those contemplating entry into the commercial development of space is the need for some assurance of at least a modicum of certainty in the law."[75] A key question here is whether the current unclear status of safety zones will increase insurance premiums – or even render commercial lunar projects uninsurable. This could destroy the viability of many commercial projects and further indicates the near-term nature of the issue.

Given the expense that will be incurred in surveying and preparing a lunar area for exploitation, commercial entities are also likely to seek exclusivity over particular areas of the Moon. A particular concern here is that safety zones may be used to protect economic interests rather than to ensure safety. As Jakhu notes, "[s]afety zones are necessary, but they can also be abused in a way that [they] may become appropriation."[76] Identifying the safeguards necessary to prevent such misuse, while also appreciating the commercial interest in safety zones, will require particular attention.

Turning to the immediate future, transparency as to safety zones will be an essential confidence building mechanism. Indeed, the Artemis Accords emphasize the importance of transparency and require signatories to "notify each other as well as the Secretary-General of the United Nations of the establishment, alteration, or

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[74] OGUNBANWO, *supra* note 17, at xvi. This is a particular concern with respect to ADIZs, in light of the demilitarized nature of the Moon under the Outer Space Treaty (and the relevant provision of the Charter of the United Nations). *See* Outer Space Treaty, *supra* note 4, art. IV.

[75] Bin Cheng, *The Commercial Development of Space: The Need for New Treaties*, 19 J. SPACE L. 17, 24 (1991).

[76] Ryan Britt, *3 Ways NASA's Artemis Accords Want to Create a Star Trek Utopia*, INVERSE (June 3, 2020), https://www.inverse.com/entertainment/star-trek-nasa-artemis-accords (quoting Ram Jakhu).

end of any safety zone".[77] States could also consider including the parameters of any relevant safety zones in their submissions to the United Nations Register of Objects Launched into Outer Space (Register).[78] The US could initiate this process now, by updating the relevant Register entries for US space objects that are currently on the Moon to reference NASA's recommended "exclusion zones."[79] This would promote best practices with respect to safety zone transparency. It would also accord with the United Nations General Assembly resolution that recommends that "any useful information relating to the function of the space object" or information regarding "a change in status of operations" be provided to the Secretary-General under the Registration Convention.[80]

V. CONCLUSION

The advent of the Artemis Accords means that the legality of safety zones is a near-term issue in international space law. This paper has explored the position of safety zones under the Outer Space Treaty and leveraged Cheng's conceptualization of jurisdiction[81] to analyze the jurisdiction that States may exercise in these zones.

The core finding is that while safety zones are supported by the Outer Space Treaty, the jurisdiction that applies over a safety zone is a limited, personal jurisdiction – no greater, in law, from that which States can generally exercise on the lunar surface.

This finding may adversely impact the utility of safety zones. But the need for safety zones as a mechanism to promote safety on the Moon remains valid. Indeed, the 2020s will likely see various national and commercial lunar programs land on the lunar surface. Safety zones could very well bloom across the Moon as a result.

We may see increasing international alignment on the establishment and enforcement of these zones. Alternatively, the current lack of clarity may persist – and, in Cheng's memorable phrasing,

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[77] Artemis Accords, *supra* note 2, § 7(d).

[78] *United Nations Register of Objects Launched into Outer Space*, U.N. OFF. OUTER SPACE AFF., https://www.unoosa.org/oosa/en/spaceobjectregister/index.html (last visited July 14, 2020).

[79] NASA Guidelines, *supra* note 69, at 70.

[80] G.A. Res. 62/101, at 3 (2008).

[81] *See generally* CHENG, *supra* note 5, at 72–80.

"[t]he side that is the first to be satisfied with its winnings, or alternatively the first to be frightened by the rate it is losing its chips, will . . . kick the table over and ring down the space curtains."[82]

Ultimately, the way forward for safety zones depends on our collective ability to agree and construct a safety zone system that is clear, logical and consistent with international law. This system should be readily comprehensible to all entities – governmental and non-governmental. Perhaps most importantly, it should have broad support from lunar-active States. This support would help prevent the creation of a "jungle of zones"[83] that would destroy the idea of the Moon as the province of all humankind.[84] This paper is a small contribution to this larger goal.

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[82] *Id.* at 35.

[83] OGUNBANWO, *supra* note 17, at xvi.

[84] Outer Space Treaty, *supra* note 4, art. I.

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