International Legal Considerations When Transitioning Telemetry, Tracking, and Command (TT&C) Controls to Receive In-Space Servicing

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Abstract

International space law is governed by four primary treaties, beginning with the Outer Space Treaty of 1967. Elegant and enduring documents, they nonetheless face criticism – they largely do not anticipate commercial space missions. With the rise of new space, it is important to consider the interplay of private law and international space law, analyzing where private interactions may alter or antagonize the principles and regimes established by the international space law treaties.

Academics have analyzed how international transfers of spacecraft *ownership* on orbit may challenge the intersection of private law and international space law. However, with the rise of in-space servicing between private companies, a more nuanced question must be asked – how will international transfers of *control* in space challenge the international legal regime? This paper will examine international legal considerations of in-space servicing under the Outer Space Treaty, Registration Convention, and instruments of the International Telecommunication Union.

1. Introduction

Imagine back to the year is 2019. For the first time, a U.S. commercial servicing spacecraft has been launched and is enroute to service a U.S. satellite just beyond the geostationary ring. In the coming months, Mission Extension Vehicle-1 (MEV-1) will dock to Intelsat-901 and take over pointing and positioning responsibilities for the "combined stack" of spacecraft, and a new era of commercial in-space servicing possibilities begins.[1]

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1 Robert Christy, *MEV-1 and Intelsat 901*, Orbital Focus (Apr. 19, 2020), https://www.orbitalfocus.uk/Diaries/US/MEV1.php.

Fast-forward to the present. With the dawn of 2023, space operators globally are racing to deploy commercial in-space servicing solutions,[2] and national attention is focused on the future possibilities enabled by in-space servicing, assembly, and manufacturing (ISAM) missions.[3] As in-space servicing technologies are further commercialized and deployed, companies will predictably seek to perform in-space servicing missions between spacecraft registered to different States.

International in-space servicing missions of this decade must be prepared to answer legal questions of first impression. To date, the limited commercial in-space servicing missions between SpaceLogistics and Intelsat involved only U.S.-registered spacecraft and provide little helpful precedent for analogous international services. Arguably, one of the most pressing and foundational questions is whether private agreements for in-space servicing that require the docking of two differently-registered space objects are legal under international space law.

This paper will examine international legal obligations that relate to "control" of space objects, and their potential constraint of international in-space servicing. To begin, this paper will lay out a hypothetical in-space servicing mission scenario.[4] Section III will analyze in-space servicing scenarios under Outer Space Treaty Article VIII, which mandates a registering State retain "jurisdiction and control" of their space objects. Following, Section IV will highlight the importance of registration, and raise real-world complications that operators may face. Section V will examine any International Telecommunication Union (ITU) requirements on what entity "controls" a spacecraft. Throughout, this paper will deliver recommendations for parties undertaking in-space servicing that may clarify or uphold legal obligations and promote the burgeoning space servicing economy.

2 *See Satellite Servicing Database,* SpaceFund (last updated Apr. 25, 2022), https://spacefund.com/satellite-servicing-sfr/. China and Russia are assumed to also have in-space servicing technology. However, it is unclear whether these capabilities will be offered as commercial services. *See, e.g.,* Andrew Jones, *China's Shijian-21 Towed Dead Satellite to a High Graveyard Orbit*, SpaceNews (Jan. 27, 2022), https://spacenews.com/chinas-shijian-21-spacecraft-docked-with-and-towed-a-dead-satellite/.

3 *See, e.g.,* Nat'l Sci. & Tech Council, Exec. Off. Of the President, In-Space Servicing, Assembly, and Manufacturing Implementation Plan (Dec. 2022), https://www.whitehouse.gov/wp-content/uploads/2022/12/NATIONAL-ISAM-IMPLEMENTATION-PLAN.pdf.

4 This paper focuses on a typical in-space servicing scenario for geostationary spacecraft. Regardless, the overarching inquiry of legal obligations that impact exchanges of "control" between international space objects remains the same across orbits.

2. A Servicing Scenario

Imagine a typical geostationary communications satellite, providing telecommunications from its orbital home approximately thirty-six thousand kilometers from Earth. Launched fifteen years ago, the spacecraft is running out of fuel, and will need to cease services and retire to graveyard orbit before all fuel is expired.[5] However, the spacecraft's telecommunications payload is still operational, and the operator would like to continue generating revenue instead of retiring the satellite. The telecommunications satellite operator – or Client Operator – goes looking for a Servicing Company to provide satellite life extension services to their aging Client satellite.

Happily, in a short amount of time, the Client Operator finds a non-national Servicing Company with which to contract. Under the satellite servicing contract, the Servicing Company will deploy their Servicer spacecraft to mechanically dock to the Client. The Servicer will thereafter take over the propulsive and pointing maneuvers that are needed to keep the Client correctly pointed and oriented within its orbital location.

Figure 1: Depiction of a Servicer spacecraft (rear) docked to a telecommunications Client (front) and providing life extension services.

While in the combined stack formation – where the Servicer and Client are mechanically docked – the Client Operator will cease telemetry, tracking, and

5 Inter-Agency Space Debris Coordination Comm., IADC-02-01, IADC Space Debris Mitigation Guidelines (Rev. 3, June 2021).

commanding (TT&C) operations for *pointing and positioning* of the Client.[6] Instead, the Servicing Company will execute all TT&C for pointing and positioning of the combined stack through commands to the Servicer. In essence, the Servicer is controlling the movement of the Client. [7] However, under the service contract, the Client Operator will dictate pointing and positioning operations of the combined stack to the Servicing Company; after all, the Client Operator may need to alter pointing of the telecommunications payload throughout the service contract. At an operations level, commanding of the Servicer will be carried out by a Servicer-dedicated Mission Control Center in State A. Client payload commanding will continue to be carried out by the Client Operator from their Mission Control Center in State Z.[8]

3. Outer Space Treaty Article VIII: "Shall retain jurisdiction and control"

Under Article VIII of the Outer Space Treaty, "[a] State Party to the Treaty on whose registry an object…is carried shall retain jurisdiction and control over such object."[9] This sentence creates both a *right* and an *obligation* for a State on whose registry an object is carried.[10] A State of registry has the right to exercise jurisdiction and control over its national space objects; the State can exercise legislative, judicial, and administrative authority over the object, and generally enjoy those powers that are attributed to a sovereign.[11] Additionally, a State of registry has an *obligation*, or responsibility, to ensure that those objects under its jurisdiction and control are carried out in accordance with the international law and the international space treaties.[12] Applied, Outer Space Treaty Article VIII mandates that the hypothetic Client Operator retain "jurisdiction and control" of the Client spacecraft; this is both a right, and an obligation. International in-space servicing scenarios

6 The Client Operator will only continue to conduct payload commanding from their operations center.

7 CONFERS, *Satellite Servicing Safety Framework – Technical and Operational Guidance Document* at 23-4 (Apr. 2018), https://www.satelliteconfers.org/wp-content/uploads/2018/07/2018-04-05CONFERSSatelliteServicingSafetyFramework.docx.

8 For the analysis in this paper, assume that the Servicing Company and Servicer have ties solely to State A (e.g. there is no other launching state, etc.). Assume that the Client Operator and Client have ties solely to State Z. Both States have ratified the major space treaties and are parties to the Constitution and Convention of the ITU.

9 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art. VIII, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [*hereinafter* OST].

10 1 Cologne Commentary on Space Law 158 (Hobe, Schmidt-Tedd & Schrogl eds., 2013) [*hereinafter* Cologne Commentary 1].

11 V. S. Vereshchetin, *International Space Law and Domestic Law: Problems of Interrelations*, 9 J. SPACE L. 31, 33 (1981).

12 *See* OST, *supra* note 9, at Art. VI, III.

accordingly raise a deceivingly simple question: if positioning and maneuvering functions of a Client spacecraft are transitioned to, and carried out by, a non-national Servicer spacecraft, does "control" of the Client change? And if control does change, has the Client Operator's private act unallowably discharged an obligation of their State Z? As will be explored below, this answer is paramount: loss of control could constitute breach of an international obligation.

3.1. International Obligation of "Jurisdiction and Control": Avoiding an Internationally Wrongful Act

The base question that must be answered for in-space servicing is whether an internationally wrongful act has occurred if TT&C positional capabilities are entrusted to a non-national. Under the Draft Articles of State Responsibility, "[t]here is an internationally wrongful act of a State when conduct consisting of an act or omission: (a) is attributable to the State under international law; and (b) constitutes a breach of an international obligation of the State."[13] Therefore, for in-space servicing to rise to the level of an internationally wrongful act, three things must be found: (1) conduct attributable to a State; (2) an international obligation of a State; and, (3) breach of the obligation.

The first element of an internationally wrongful act – conduct attributable to a State – is answered within the Outer Space Treaty. Codified in Article VI, "State Parties to the Treaty shall bear international responsibility for national activities in outer space,…"[14] Even space activities conducted by private entities are attributable to their State.[15] Therefore, when a Client Operator cedes pointing and positioning TT&C controls of their Client to the Servicing Company, this private act is attributable to the Client Operator's State.[16] As such, the first element required for an internationally wrongful act is satisfied in situations of in-space servicing.

13 *Draft Articles on the Responsibility of States for Internationally Wrongful Acts*, [2001] 2 Y.B. Int'l L. Comm'n 26, at Article II, U.N. Doc. A/CN.4/SER.A/2001/Add.1 (Part 2) [*hereinafter* ARSIWA].

14 OST, *supra* note 9, at Art. VI.

15 *See* Christian Joseph Robison, *Changing Responsibility for a Changing Environment: Evaluation the Traditional Interpretation of Article VI of the Outer Space Treaty in Light of Private Industry*, 5 U. Bologna L. Rev. 1, 9-11 (2020); Ricky J. Lee, *Liability Arising from Article VI of the Outer Space Treaty: States, Domestic Law and Private Operators*, 48 Proc. L. Outer Space 216, 217 (2005).

16 This would be true even if the TT&C authority was ceded in violation of the client entity's national laws. *See* Armel Kerrest, *Remarks on the Responsibility and Liability for Damages Caused by Private Activity in Outer Space*, 40 Proc. L. Outer Space 134, 139 (1997) ("[I]n the case of a violation by the private entity of any international regulation or principle, the state should be responsible without having the possibility to avoid liability by proving ignorance of such a violation, nor even by showing it had made its best effort to control the activity.").

The second element of an internationally wrongful act analysis is identification of an international obligation. An "obligation" can be understood as a "duty to do or not to do something,"[17] or, "a formal, binding agreement."[18] International obligations "may be established by a customary rule of international law, by a treaty or by a general principle applicable within the international legal order…An international obligation may arise from provisions stipulated in a treaty."[19] As clearly stated in the Outer Space Treaty Article VIII, States have an obligation to "retain jurisdiction and control."[20] Therefore, the second element required for an internationally wrongful act – an identified international obligation – exists.
The final element that must be present for an internationally wrongful act is breach of the identified international obligation. "There is a breach of an international obligation by a State when an act of that State is not in conformity with what is required of it by that obligation…"[21] Therefore, if transferring pointing and positioning TT&C capabilities to a non-national during in-space servicing is a breach of the international obligation for a State to "retain…control," all elements for an internationally wrongful act are present. The following section will examine what is envisioned by "jurisdiction and control," to answer whether a breach of the international obligation occurs during in-space servicing.

3.2. Defining and Retaining "Jurisdiction and Control" During In-Space Servicing

Outer Space Treaty Article VIII creates an international obligation for States to "retain jurisdiction and control." The retention of "jurisdiction" from "jurisdiction and control" by a State is not in dispute for the presented in-space servicing scenario. "Jurisdiction" "means the legislation and enforcement of laws and rules in relation to persons and objects."[22] It is not anticipated that an in-space servicing company would attempt to interfere with a State's right, or obligation, to pass legislation or enforce laws and

17 Legal Information Institute, *Obligation*, Cornell L. School (July 2021), https://www.law.cornell.edu/wex/obligation#:~:text=Primary%20tabs,%2Dcontract%2C%20or%20unilateral%20promise.
18 Ken Adams, *Terminology Relating to Obligations*, Adams Contract Drafting (Nov. 9, 2006), https://www.adamsdrafting.com/terminology-relating-to-obligations/#:~:text=Black's%20Law%20Dictionary%20defines%20obligation,formal%20agreement%20or%20promise%2C%20usu (quoting Black's Law Dictionary).
19 ARSIWA, *supra* note 13, at Article 12 Commentary (3); *see id.* at General Commentary (4)(a) (noting that "obligations," or particular "primary rules" of international law is a matter of the law of treaties).
20 OST, *supra* note 9, at Art. VIII.
21 ARSIWA, *supra* note 13, at Art. 12.
22 Cologne Commentary 1, *supra* note 10, at 157 ¶ 48.

rules that affect a national Client.[23] Nonetheless, a best practice can be suggested – an in-space servicing contract should explicitly state that a Servicing Company will respect jurisdictional actions passed by the State of registry affecting a Client.[24]

Recommendation #1: Servicing contracts should explicitly state the registering State retains jurisdiction over their space object, and the servicing company will comply with jurisdictional (legislative and enforcement) proceedings that impact the Client.

Defining "control" and analyzing its retention by the Client's State is slightly more challenging. There are two primary ways to view control in the given instance of in-space servicing. First, if control is understood in the most technical sense, the Servicing Company's State – State A – would gain control of both spacecraft during in-space servicing. This is because a State A national, the Servicing Company, now commands the spacecraft combined stack. [25] The Servicing Entity of State A, through the Servicer spacecraft registered in State A and its local Mission Control Center, is determining the pointing and positioning of the Client spacecraft; "control" of movement.
However, under a second possible and broader view, the Client Operator's State – State Z – would retain control over the Client. Notably, the service contract empowers the Client Operator to direct the Servicing Company on how pointing of the combined stack should be conducted. Therefore, the physical positioning activities of the Client are still directed by a State Z national entity, upholding State Z's "control."
Happily for the future of in-space servicing, it is unlikely conclusion that "control" is understood by reflecting on technical minutia. Rather, "[j]urisdiction and control" must be read *together*, as one block, with "'[c]ontrol'…based on legitimate jurisdiction and not on factual control capabilities."[26] Put another way, "[j]urisdiction should induce control and

23 Intriguingly, in maritime law, the exclusive jurisdiction of a State over a vessel may be challenged in cases of (1) piracy, (2) slave trading, and (3) oil pollution damages or threat thereof. *See* John W. Stewart, *Port State Control: A Contemporary Legal Study,* WORLD MARITIME U. DISSERTATIONS 1, 12-3 (1990), https://commons.wmu.se/cgi/viewcontent.cgi?article=1882&context=all_dissertations. This author suggests that further inquiry could be made into corollary cases in space law under which the "jurisdiction" of a State could be challenged; perhaps this would include an unregistered satellite, or a satellite causing or threatening to cause debris creation.

24 Vereshchetin, *supra* note 11, at 34.

25 Gabriel Lafferranderie, *Jurisdiction and Control of Space Objects and the Case of an International Intergovernmental Organisation (ESA)*, 54 German J. Air & Space L. 228, 235 (2005).

26 Cologne Commentary 1, *supra* note 10, at 157 ¶ 51.

control should be based on the jurisdiction, it being understood that the State of jurisdiction could entrust to specific entities the implementation of certain measures of control, subject to rules to be agreed."[27]

This reading of "jurisdiction and control" as a totality of circumstances, and not dissected to the most technical level, is supported by comparative international law. While the Outer Space Treaty was ratified in 1967, the phrase "jurisdiction and control" as seen in Article VIII predates the Outer Space Treaty's ratification. In 1962, the U.N. Convention on the High Seas entered into force, codifying international law relating to the high seas.[28] Article 5(1) of the Convention uses the term "jurisdiction and control," stating, "[t]here must exist a genuine link between the State and the ship; in particular, the State must effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag."[29] The comparison to maritime law is appropriate, as both regimes reference jurisdiction and control "as a consequence of the non-appropriate principle and the absence of reference to the State sovereignty."[30]

In 1993, Article 94 of the U.N. Convention on the Law of the Sea elucidated what comprises a State "effectively exercise[ing] jurisdiction and control."[31] Subsections (3)-(4) list requirements "[e]very State shall take," such as ensuring seaworthiness of a vessel, signal use, labor conditions, and training and appropriateness of the crew.[32] Intriguingly, reading Article 94 with

27 Lafferranderie, *supra* note 25, at 231-32.

28 The Convention on the High Seas was signed April 29, 1958, and entered into force on September 30, 1962. United Nations Convention on the High Seas Annex II art. 5(1), Apr. 29, 1958, 13 U.S.T. 2312, 450 U.N.T.S. 11.

29 *Id*.

30 Sergio Marchisio, *National Jurisdiction for Regulating Space Activities of Governmental and Non-Governmental Entities*, U.N. & THAI. WORKSHOP SPACE L. 1, 4 (Nov. 2010), https://www.unoosa.org/pdf/pres/2010/SLW2010/02-02.pdf; *see also Articles Concerning the Law of the Sea with Commentaries*, [1956] 2 Y.B. Int'l L. Comm'n 295-96, A/CN.4/SER.A/1956/Add.1 ("The Commission accepted the idea that the State may exercise control and jurisdiction over the continental shelf, with the proviso that such control and jurisdiction shall be exercised solely for the purpose of exploiting its resources; and it rejected any claims to sovereignty or jurisdiction over the superjacent waters.").

31 M/V Saiga Case No. 2 (St. Vincent and the Grenadines v. Guinea), ITLOS Rep. 1999 ¶ 81-82 (Judgment of July 1, 1999) [*hereinafter* M/V Saiga Case No. 2]. The first coalescence of the U.N. Conference on the Law of the Sea resulted in the 1958 Convention, along with three other treaties. Eventually, the third Conference concluded the U.N. Convention on the Law of the Sea, replacing the previous four treaties (including the 1958 Convention). *See* Int'l Relations & Def. Comm., *UNCLOS: The Law of the Sea in the 21stCentury*, U.K. House of Lords at 4 (2nd Rep. of Session 2021-22), https://committees.parliament.uk/publications/9005/documents/159002/default/.

32 *See* United Nations Convention on the Law of the Sea art. 94(3)-(4), Dec. 10, 1982, 1833 U.N.T.S. 397 [*hereinafter* UNCLOS III].

Article 217[33] leads to the conclusion that a State with jurisdiction and control over a vessel must discharge its responsibilities in regard to the vessel as a whole, regardless of the nationality of persons on board.[34] As a corollary, it is recognized that technical aspects of control in the hands of non-nationals does *not* mean a State no longer retains "jurisdiction and control" over an object registered to it. In M/V Saiga Case No. 2, the judgment states, "the ship, every thing on it, and every person involved or interested in its operations are treated as an entity linked to the flag State. The nationalities of these persons are not relevant."[35]

The conclusion that a non-national's technical "control" of a space object does not interrupt a State's "jurisdiction and control" is also supported by current practice. The International Space Station (ISS) demonstrates that two or more joined space objects can retain distinct State "jurisdiction and control" while nonetheless cooperatively completing a mission. Technically, the ISS thrusters are all U.S. or Russian;[36] however, this technical control over the ISS' positioning does not impact, for instance, Europe's claim of control of the Columbus laboratory.[37] In fact, the Columbus laboratory has its own Control Center, similar to how a Servicer and Client would each continue to be commanded through dedicated Mission Control Centers.[38] The international understanding of which Partner nation has "jurisdiction and control" over various segments of the ISS is laid out in the Intergovernmental Agreement (IGA). Article V specifically states that "[p]ursuant to Article VIII of the Outer Space Treaty…, each Partner shall retain jurisdiction and control over the elements it registers..."[39] The ISS IGA therefore demonstrates

33 UNCLOS III, *supra* note 31, at Art. 217 (listing terms for "enforcement by flag States").

34 M/V Saiga Case No. 2, *supra* note 31, at ¶ 105. ("The Convention contains detailed provisions concerning the duties of flag States regarding ships flying their flag. Articles 94 and 217, in particular, set out the obligations of the flag State which can be discharged only through the exercise of appropriate jurisdiction and control over natural and juridical persons such as the Master and other members of the crew, the owners or operators and other persons involved in the activities of the ship. *No distinction is made in these provisions between nationals and non-nationals of a flag State*." [emphasis added]).

35 *Id.* at ¶ 106.

36 Robert Dempsey, NASA, The International Space Station: Operating an Outpost in the New Frontier 1, 128 (2018).

37 *See* Lafferranderie, *supra* note 25, at 231.

38 *See Columbus Laboratory*, ESA, https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/Columbus/Columbus_laboratory (last visited Sept. 18, 2022).

39 Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, The Government of the Russia Federation, and the Government of the Unites State of America Concerning Cooperation on the Civil International Space Station art. 5, Jan. 29, 1998, T.I.A.S. 12927.

States may holistically retain "jurisdiction and control" over a space object while technical pointing and positioning controls are conducted as a service by a non-national entity.

Concluding the above, in-space servicing through mechanical docking does not alter which State has "jurisdiction and control" over a space object. As discussed *supra*, in-space servicing is not expected to challenge national "jurisdiction" over a space object. Continuing, while *technical* "control" of a Client may be impacted by in-space servicing, control operations overwhelmingly are still within the power of the Client Operator and their State to direct; in-space servicing would not be worth much (or anything) if a Servicing Company did not follow directives of where a Client is to be pointed. Together, a Client Operator and their State would retain jurisdiction and control in line with international obligations, with the Servicing Company being a means by which control is accomplished. Therefore, in-space servicing scenarios do not constitute a breach of the international obligation to "retain control" flowing from Outer Space Treaty Article VIII, and no internationally wrongful act occurs.

To support the continued understanding that technical "control" may be executed as a service by a non-national without violating the international obligation of a State to retain "jurisdiction and control," the following is offered as an additional best practice.

***Recommendation #2*:** Servicing contracts should be modeled after the IGA Article V, stating that a Client's registering State retains "jurisdiction and control," subject to relevant implementing arrangements and procedural mechanisms.

4. "Jurisdiction and Control": Considering the Quandary of Registration

Recall once more that the first sentence of Article VIII states "[a] State Party to the Treaty on whose registry an objected launched into outer space is carried shall retain jurisdiction and control over such object."[40] From this treaty provision, it can be concluded that "jurisdiction and control" can *only* belong to the State on whose national registry an object is carried.[41] "Without the first step of national registration, no jurisdiction and control over the space object in question is feasible."[42]

40 OST, *supra* note 9, at Art. VIII.

41 While the Outer Space Treaty impliedly created a national registry system through Article VIII, the international requirements for space object registration were later codified under the Registration Convention. Cologne Commentary 1, *supra* note 10, at 148 ¶ 6; *id*. at 150 ¶ 17.

42 *Id*. at 152 ¶ 26.

The subsequent Registration Convention supports the above conclusion that technical "control" may be contracted to a non-national without breaching the international legal obligation to retain "jurisdiction and control." In cases of multiple launching States, the Registration Convention Article II(2) allows the States to jointly determine who shall register a space object, "without prejudice to appropriate agreements concluded or to be concluded among the launching States on jurisdiction and control."[43] This construction – permitting registration by a State based on concurrence as opposed to investigation of technical operational functions and assignment to the "principal" State – supports the conclusion that "jurisdiction and control" "is generally abstract and independent of the question of practical supervision by a control-center, possession or ownership."[44] In-space servicing contracts that assign control aspects to a non-national are permissible under international legal obligations.[45]

Space object registration by a State denotes their "jurisdiction and control" over the object. Unfortunately, the clarity of this regime – registration and resultant jurisdiction and control – is complicated by real-world scenarios. In reality, there are instances where: (1) not all space objects are registered;[46] (2) not all space objects are registered in a timely fashion;[47] (3) some objects may be registered twice;[48] (4) some States assert "jurisdiction and control" without having ever registered a space object;[49] (5) changes in ownership may convolute who has *de facto* versus *de jure* "jurisdiction and control";[50] and, (6) the discussion of registration can inevitably turn to the discussion of who qualifies as a launching State.[51] Summarily, Servicing Companies and Client Operators may face situations that span from no State having "jurisdiction

43 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.

44 2 Cologne Commentary on Space Law 256 ¶ 57 (Hobe, Schmidt-Tedd & Schrogl eds., 2013) [*hereinafter* Cologne Commentary 2].

45 *Id.* at 256 ¶ 57 (discussing that a State of registry will retain the obligation of jurisdiction and control even in cases of transfers of ownership, but that this does not exclude the contractual transmission of rights and duties).

46 Cologne Commentary 2, *supra* note 44, at 259 ¶ 65.

47 *See* Bin Cheng, *The Commercial Development of Space; The Need for Treaties*, 19 J. Space L. 17, 33 (1991).

48 Cologne Commentary 2, *supra* note 44, at 256 ¶ 60; *id.* at 258 ¶ 64.

49 *See* Information Furnished in Conformity with the Convention on Registration on Objects Launched into Outer Space, Note Verbale dated June 3, 2009 from the Permanent Mission of the Netherlands to the United Nations addressed to the Secretary-General, U.N. Doc. ST/SG/SER.E/INF.24 (June 3, 2009).

50 *See* Upasana Dasgupta, *On-Orbit Transfer of Satellites Between States: Legal Issues – with Special Emphasis on Liability and Registration*, 2016 Int'l Inst. Space L. 641, 654 (Oct. 2019).

51 Cologne Commentary 2, *supra* note 44, at 251 ¶ 40 ("Registration is reserved to launching States.").

and control" over the Client spacecraft,[52] to multiple States claiming "jurisdiction and control," placing non-governmental operators is an unenviable position of quasi-arbitrating international issues of registration. This paper does not answer how to proceed in the above situations. Rather, it is hoped that the list emphasizes the need for international collaboration on how to enable in-space servicing in a convoluted legal environment.

5. The International Telecommunication Union and In-Space Servicing

There are no specific provisions of the ITU Constitution or Radio Regulations that mandate who must have "control" over an operational satellite, or how control is determined. Rather, the ITU is concerned with ensuring that an "operating agency"[53] does not contravene terms of the ITU Constitution or Radio Regulations;[54] outside of this constraint, States are free to arrange operational matters for themselves.[55]

Nonetheless, States should remain appraised of in-space servicing operations. Under ITU Constitution Article 38.5, States must "recognize the necessity of taking practical measures to prevent…installations of all kinds from disrupting the operation of telecommunication installations within the jurisdiction of other Member States."[56] In the provided hypothetical, the Servicer would be an "installation" of State A, and the Client is likewise an installation within the jurisdiction of State Z. Therefore, State A likely has an obligation to keep their nationally-registered Servicer from disrupting telecommunication operations of the foreign-registered Client to the extent practicable.[57]

52 *Id.* at 251 ("[W]ithout the first step of national registration, no jurisdiction and control over the space object in question is attributed."); *see also id.* at 259 ¶ 65 (discussing the fact that no launching State had registered Iridium 33, so at the time of the Iridium 33/Cosmos 2251 collision, there was no legal basis for jurisdiction and control on the State behind the operator).

53 Constitution and Convention of the International Telecommunication Union (with annexes and optional protocol) annex 1007, Dec. 22, 1992, 1825 U.N.T.S. 31251.

54 *Id.* at Art. 45(1), 45(2).

55 *Id.* at Art. 42.

56 *Id.* at Art. 38.5.

57 While beyond the scope of this paper, further questions of 'interference' and legality relating to in-space servicing should be explored. These issues may parallel with similar investigations into the legality of signals interference with communication satellites generally. *See* Sarah M. Mountin, *The Legality and Implications of Intentional Interference with Commercial Communication Satellite Signals*, 90 Int'l L. Stud. 101 (2014).

6. Conclusion

International in-space servicing missions face legal questions of first impression as they traverse the bounds of both international and national space law. This paper provides an answer to the initial inquiry of whether mechanically docking two spacecraft, and ceding pointing and positioning controls from one entity to another non-national entity, is legal. It can be concluded that the Outer Space Treaty, Registration Convention, and rules of the ITU permit technical "control" of a spacecraft to be passed to a non-national in instances of in-space servicing.