SPACE DEBRIS AND PRIVATE ACTIVITIES:

Can a Private Operator Change its Licence to Reduce its Obligation to Mitigate Space Debris?

By

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December 2023

A thesis submitted to McGill University as a partial fulfilment of the requirements of the degree of Masters of Law (LLM in Air and Space Law).

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Acknowledgements

Nanos gigantum humeris insidentes (Dwarfs standing on the shoulders of giants)
— attributed to Bernard of Chartres by John of Salisbury in 1159.

I would like to express my deepest gratitude to my supervisor, Professor Catherine Walsh, for her valuable feedback and patience with me throughout this work. I would also like to thank the Institute of Air and Space Law at McGill University, especially Professor Ram Jakhu, who has supported and inspired me throughout this degree. My special thanks go to Gillian Xu and Zeina Jhaish, who patiently spent many hours reading and correcting my grammar while I wrote this thesis.

I would also like to thank my fellow Sarin Leiden Air Law Moot team members, Matthew Ormsbee and Laura Triana Castano, as well as my other classmates, especially Beatrice Dragomir, for their continuous support and motivation throughout this process. I also thank Nya Gneagi for proofreading the French translation of my abstract.

It would be an oversight on my part if I did not mention my parents, especially my father, who has supported me in my academic career and read all my papers, including this one, and provided valuable feedback. Without your invaluable support, I would not be here. Finally, I would like to thank Dr William Ailor of The Aerospace Corporation, without whom I would never have studied space law and found my passion.

Abstract

Over the last three decades, space has been redefined. Private actors have invested heavily in space activities, with a focus on planned mega-constellations such as OneWeb and Starlink. These private projects have significantly increased the number of objects in orbit and renewed the debate on the role of private actors and their obligation to mitigate space debris. This thesis addresses the legal justification for States to license private actors and which activities need a licence. However, the primary focus is on the possibility for a private actor to change its licence — through the creation of a subsidiary — from one State to another after the object has already been launched. This change would enable the private operator to obtain more favourable terms and conditions and avoid the obligation to limit the creation of space debris, contrary to the sustainability of Earth orbits. This thesis concludes by examining whether the International Telecommunication Union could be the best venue to achieve consensus for a potential solution to the problem.

Résumé

Au cours des trois dernières décennies, l'espace a été redéfini. Les acteurs privés ont investi dans les activités spatiales, en se concentrant sur les méga-constellations prévues comme OneWeb et Starlink. Ces lancements privés ont non seulement significativement augmenté le nombre d'objets en orbite, mais ont également renouvelé la discussion sur le rôle des acteurs privés. Cette thèse se concentrera sur les régulations des acteurs privés pour la mitigation de la création de débris spatiaux. La thèse examinera la justification légale pour les États d'autoriser les licences des acteurs privés, ainsi que les activités nécessitant une licence. Cependant, l'objet premier de la thèse est la question d'un acteur privé changeant sa licence d'un État à un autre une fois l'objet a déjà été lancé. Ce changement, rendu possible par l'utilisation d'une filiale, permettrait à l'opérateur privé d'obtenir des conditions plus favorables et d'éviter l'obligation de limiter la production de débris spatiaux. Étant donné qu'une telle utilisation abusive du système serait contraire au bien-être des orbites terrestres, cette thèse se terminera en examinant si l'Union internationale des télécommunications pourrait apporter une solution potentielle au problème des débris spatiaux.

1. Introduction

Space is no longer the final frontier for private activities and actors. Just over three decades have passed since the first launch of a private satellite in 1988.[1] SpaceX, one of the best-known private space companies, was founded twenty years later.[2] The influence of private companies on the Western world's space programmes should not be underestimated. The National Aeronautics and Space Administration (NASA) has used SpaceX for cargo launches since 2012, and for crew launches to the International Space Station since 2020.[3] Other groundbreaking projects, such as the recent DART (Double Asteroid Redirection Test) mission, have also been carried out using launch services offered by SpaceX. Similarly, the European Space Agency (ESA) relies on commercial launchers, especially the services of Arianespace and SpaceX.[4]

While the recent development of launch capabilities by NASA may reduce reliance on private actors by governments going forward, this does not determine the end of private space activities.[5] The latest trend, in addition to commercial space flights, seems to be satellite mega-

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[1] See SpaceRef Editor, "PanAmSat's new PAS-1R Satellite in Position to Power Top Video, Internet, and Data Customers" *SPACERef* (February 20, 2001) online: <spaceref.com/press-release/panamsats-new-pas-1r-satellite-in-position-to-power-top-video-internet-and-data-customers/>.

[2] Note that SpaceX was founded in 2002, but that the importance of SpaceX arguably started with the successful launch of Falcon 1 in 2008. Alison Eldridge "SpaceX" (2023) in Encyclopaedia Britannica <www.britannica.com/topic/SpaceX>; "Mission" (2023) online: *SpaceX* <www.spacex.com/mission/>.

[3] See "Space Station" (2023) online: *SpaceX* <www.spacex.com/human-spaceflight/iss/>.

[4] Note that Arianespace, considered the world's first commercial launcher, has been used by ESA for the Juice mission to Jupiter, while Euclid was launched with a Falcon 9, SpaceX. "About US" (2010-2023) online: *Arianespace* <www.arianespace.com/about-us/>; "Juice" (accessed 19 July 2023) online: *European Space Agency* <www.esa.int/Science_Exploration/Space_Science/Juice>; "Euclid: preparing for launch" (30 June 2023) online: *European Space Agency* <www.esa.int/Science_Exploration/Space_Science/Euclid/Euclid_preparing_for_launch>.

[5] Note that Artemis I demonstrates the functionality of NASA's Space Launch Systems that are intended to take astronauts to the Moon. "The Great Escape: SLS Provides Power for Missions to the Moon" (3 July 2023) online: *National Aeronautics and Space Administration* <www.nasa.gov/humans-in-space/space-launch-system/the-great-escape-sls-provides-power-for-missions-to-the-moon-duzxi/>.

constellations. The first satellites in the two best-known mega-constellations, OneWeb and Starlink, were launched in 2019.[6] A few months after it launched Starlink, SpaceX applied to add 30,000 satellites to its constellation.[7] The significance of its request becomes apparent when the number of space debris is compared currently in Earth's orbit, estimated by NASA in 2022 to number 25,000 objects larger than 10 cm,[8] and by ESA in 2023 to number 36,500 objects larger than 10 cm.[9] In addition, there are currently 15,962 satellites registered on the United Nations (UN) registry for space objects, although not all objects are still active. So, if SpaceX succeeds in expanding its Starlink network, the number of objects in orbit will increase exponentially.[10]

The increasing activity of private players in space is also illustrated by comparing the number of private and public launches. In May 2023 alone, SpaceX launched five Falcon 9s, solely for Starlink.[11] By comparison, the largest number of launches per year in NASA's space shuttle

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[6] See "OneWeb Makes History as First Launch Mission is Successful" (28 February 2019) online: *OneWeb* <oneweb.net/resources/oneweb-makes-history-first-launch-mission-successful>; Jonathan O'Callaghan "SpaceX Launches First Starlink Satellites In Space Internet Battle" *Forbes* (23 May 2019) online: <www.forbes.com/sites/jonathanocallaghan/2019/05/23/spacex-launches-first-starlink-satellites-in-space-internet-battle/?sh=454441cf9024>.

[7] See Jonathan O'Callaghan "SpaceX's Application For 30,000 Extra Starlink Satellites Highlights Concerns About Regulation" *Forbes* (16 October 2019) online: <www.forbes.com/sites/jonathanocallaghan/2019/10/16/spacex-accused-of-evading-rules-with-proposal-for-30000-extra-starlink-satellites/?sh=40f5c5a654f8>.

[8] "Frequently Asked Questions" (26 May 2021) online: *National Aeronautics and Space Administration Orbital Debris Program Office* <orbitaldebris.jsc.nasa.gov/faq/>.

[9] "Space debris by the numbers" (6 June 2023) online: *European Space Agency* <www.esa.int/Space_Safety/Space_Debris/Space_debris_by_the_numbers>.

[10] Note that about 4,627 of the current 15,962 objects in the UN registry are already Starlink satellites. "Online Index of Objects Launched into Outer Space" (2023, accessed 2 August 2023) online: *United Nations Office for Outer Space Affairs* <www.unoosa.org/oosa/osoindex/search-ng.jspx?lf_id=> (entries for Starlink).

[11] See "STARLINK MISSION" (4 May 2023) online: *SpaceX* <www.spacex.com/launches/mission/?missionId=sl5-6>; "STARLINK MISSION" (10 May 2023) online: *SpaceX* <www.spacex.com/launches/mission/?missionId=sl2-9>; "STARLINK MISSION" (14 May 2023) online: *SpaceX* <www.spacex.com/launches/mission/?missionId=sl5-9>; "STARLINK MISSION" (19 May 2023) *SpaceX* <www.spacex.com/launches/mission/?missionId=sl6-3>; "STARLINK MISSION" (30 May 2023) online: *SpaceX* <www.spacex.com/launches/mission/?missionId=sl2-10>.

programme was nine launches in 1985, including the failed Challenger launch.[12] The difference in the number of launches depends not only on the private actor but also on other factors, such as a reduction in launch costs and the difference between crew and cargo launches. Nevertheless, it shows that the presence of private actors in Earth's orbit continues to increase.

The presence of private actors is significant internationally because when the Outer Space Treaty was being negotiated, the question arose as to whether private actors should be allowed to participate in space activities. The United States (US) was in favour, while the then Soviet Union was against private missions. As a compromise, Article VI makes States internationally responsible for the actions of all actors, private or otherwise.[13] Article VI, in turn, has been used as a basis for adopting national legislation by States regulating domestic space operators, including private operators.[14]

Simultaneously, as the emergence of private operators in the space industry, concerns about 'space debris' – i.e., artificial objects still orbiting Earth but no longer operational, have arisen. In 1978, Donald Kessler published a groundbreaking article on what has come to be called the Kessler Effect.[15] Kessler recognized the danger of space debris and observed that a collision that

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[12] See "Space Shuttle missions" (29 June 2011) online: *European Space Agency* <www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/Space_Shuttle/Space_Shuttle_missions>.

[13] See Frans von der Dunk "The Origins of Authorisation: Article VI of the Outer Space Treaty and International Space Law" in Frans von der Dunk, ed, *National space legislation in Europe: issues of authorisation of private space activities in the light of developments in European space cooperation* (Leiden: Brill, Nijhoff, 2011) 3, at 3–4; *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 27 January 1967, 610 UNTS 205, art VI, (entered into force 10 October 1967) [*Outer Space Treaty*].

[14] See the discussion in chapter 4 on this topic.

[15] See "Donald J Kessler" (accessed 2 August 2023) online: *International Astronautical Federation* <www.iafastro.org/biographie/donald-j-kessler.html>.

causes debris creates more debris, which could lead to a potential space debris belt around Earth, similar to the asteroid belt.[16] His findings, combined with the uncontrolled re-entry of Cosmos 954 and Skylab in the late 1970s, led to the creation of NASA's Orbital Debris Program.[17]

Today, space debris is one of the most discussed topics in space studies. Leading space law scholars around the world have written on how space debris might be mitigated effectively.[18] However, international efforts are still limited to soft law instruments.[19] As there is still no internationally binding legal obligation to reduce space debris, there is also no internationally uniform obligation for private actors to mitigate space debris created by their mega-constellations. In colloquial terms, uncontrolled mega-constellations are pouring petrol on a fire. Therefore, combined with the increase in non-State activities in space, effective international regulation of private actors in relation to the mitigation of space debris is essential.

So, how can the creation of space debris be mitigated? Kessler suggested that the only way is to remove non-functional space objects, i.e. space debris, from orbit.[20] This can be done through controlled re-entry or by moving the object from its original orbit to a so-called junkyard orbit.[21]

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[16] See Donald J Kessler "Collision frequency of artificial satellites: The creation of a debris belt" (1978) 83:A6 J Geophysical Research: Space Physics 2637.

[17] See "A history of Space Debris" (2 November 2022) online: *Aerospace* <aerospace.org/article/brief-history-space-debris>.

[18] See, for example, the articles by Frans von der Dunk, Steven Freeland and Lucy Stewardson, as well as Ram Jakhu, Yaw Nyampong and Tommaso Sgobba, discussed in the literature review.

[19] For example, the IADC guidelines for space debris mitigation. Inter-Agency Space Debris Coordination Committee "IADC Space Debris Mitigation Guidelines" (2020) online (pdf): *National Aeronautics and Space Administration* <orbitaldebris.jsc.nasa.gov/library/iadc-space-debris-guidelines-revision-2.pdf>.

[20] Kessler, *supra* note 16 at 2645.

[21] See Michael Byers & Aaron Boley, *Who Owns Outer Space?* (Cambridge: Cambridge University Press, 2023) 318, for the ISO recommendations on the topic.

Both methods require the use of rocket fuel. This is not only expensive but also limits the lifetime of the object, as the fuel, for example, could instead be used to manoeuvre the object to avoid collisions with other objects in orbit.[22] This cost is borne by the private operator. While the development of refuelling capabilities reduces concerns about limiting the object's lifetime,[23] launching to refuel an object is also costly.

Due to the expectations of investors in the space industry, it can be assumed that private companies, absent binding regulatory intervention, will prioritize profit over environmental concerns. This preference can be observed in the oil industry. For example, in the United Kingdom (UK) and Canada, there are problems with private companies being unwilling or unable to dismantle their defunct oil platforms.[24] The potential inability of private actors to mitigate space debris can also be observed in the satellite industry. Iridium, for example, which had already launched several satellites and was planning a mega constellation, went bankrupt and could not continue with its planned launches, nor de-orbit the already launched objects.[25] Other private space companies have similarly failed.[26]

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[22] Note, for example, that the ISS carried out around 30 manoeuvres to avoid collision with space debris. *Ibid* at 264.

[23] See, for example, the refueling capabilities developed by Lockheed Martin. "Refueling Satellites in Space" (7 September 2021) online: *Lockheed Martin* <www.lockheedmartin.com/en-us/news/features/2021/refueling-satellites-in-space.html>.

[24] See Adam Vaughan "UK taxpayers face multi-billion burden for dismantling of North Sea rigs" *The Guardian* (29 June 2017) online: <www.theguardian.com/business/2017/jun/29/taxpayers-face-growing-burden-for-dismantling-of-north-sea-rigs>; Omar Mawji "Canada's Oil and Gas Decommissioning Liability Problem" (May 2022) online (pdf): *Institute for Energy Economics and Financial Analysis* <ieefa.org/sites/default/files/2022-05/Canadas Oil and Gas Decommissioning Liability Problem_May 2022.pdf >.

[25] See Scott Madry & Joseph N. Pelton "Historical Perspectives on the Evolution of Small Satellites" in Joseph Pelton & Scott Madry, eds, Handbook of Small Satellites, (Cham: Springer, 2019) 33, at 36–38.

[26] *Ibid,* at 38.

Given this likelihood of private actors being unwilling or unable to mitigate space debris, can they avoid doing so by acquiring a more favourable licence? As this would be contrary to the sustainability of Earth's orbits, this, in turn, raises the question of who can effectively standardize national licences and thus prevent private actors from abusing the current system. This is the two-part research question addressed in this thesis.

2. Overview of Thesis

To answer the research questions, three issues need to be clarified. First, how the current regime is structured and how it regulates the mitigation of space debris. Second, how the current regime governs changes to licences. And finally, how changes to licences might be influenced by international legislation. An overview over these three issues, each covered in a separate chapter, and the interrelationship between them, are explored below.

Chapter 4, the first substantive chapter, sets out the background of national licensing regimes, and addresses four main considerations. First, the basis for national regulation of private actors is examined, focusing on Article VI of the Outer Space Treaty. It is argued that a State does not need to have private activity to enact national space laws which in turn give rise to a licensing requirement. Instead, a link between Article VI of the Outer Space Treaty and national legislation can be established.

Second, establishing a link between licences and Article VI of the Outer Space Treaty allows for an analysis of the specific terminology in that Article to examine the extent to which national legislation applies to different activities and actors. To determine what activities require a State licence, the meaning of the term ‘national activity’ in Article VI is examined on a comparative national law basis. As will be shown, national licences can be placed on a spectrum between licences for launches only and licences for both launches and space operations.

Regarding the question of who needs a licence, the meaning of the term ‘appropriate State’ in Article VI is discussed. Again, it is shown that on a comparative basis most States have extended their licencing requirements beyond their territorial borders. These conclusions are relevant to the discussion in chapter 5, which deals with whether obtaining a licence in a new, more favourable State, is possible.

Third, chapter 4 examines the lack of linkage between the licencing State and the State of registration of the space object. It is shown that while there appears to be a connection on the surface, and while the same State usually grants the licence and registers the object, no direct connection can be established. This leads to the need in the first part of chapter 5 to explore whether it is possible to change registration to a third, non-launching State, alongside the licence.

Finally, chapter 4 examines the inclusion of space debris mitigation obligations in the different licences. Here, it is found that there are no international legal obligations to include space debris mitigation in the licence, only soft law guidelines issued by intergovernmental organizations,

such as the Inter-Agency Space Debris Consultation Committee (IADC) and the United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS). It will be seen that most national laws, nevertheless, impose some mitigation obligations, and that these are mostly in line with the guidelines mentioned. However, the soft law nature of the guidelines and the limited membership of the IADC leaves open the possibility that some States do not. This, in turn, leads to the first part of the research question, which is considered in more detail in chapter 5. The conclusion in chapter 5 that abuse of the system is possible, combined with the soft law nature of the Guidelines, leads to the argument in chapter 6 that an internationally unified legal regime is needed.

After explaining the background of the licensing system in Chapter 4, Chapter 5 turns to the first and main part of the research question: Can a private actor avoid space debris mitigation obligations by changing its licencing requirements? The chapter is divided into three sections.

Based on the conclusions drawn in Chapter 4 on registration and licensing, the first part of Chapter 5 considers a transfer of registration. Here, the focus is on the link between registration and a launching State. Academic views and various national laws appear to show a link between registration and the launching State. However, it is argued that the example of Marcopolo-1 shows that a transfer of registration to a non-launching State is nevertheless possible.

The second part of chapter 5 deals with the question of the transfer of a licence. By comparing the national rules of nine representative civil law and common law countries, it is shown that the

transfer of a licence depends on the original licencing State and that a transfer does not always allow a private actor to escape its original space debris mitigation obligations. Chapter 5 then examines whether it is possible to cancel a licence in the original State(s) and acquire a new licence in a different State. Again, by comparing national laws, it is shown that it is neither possible to cancel a licence nor to obtain a new one.

This leads to the third part of chapter 5, which examines the possibility that a private actor can avoid its space debris mitigation obligations by transferring control over the object to a subsidiary company, concluding it can do so, although this depends on the consent of the original licencing State(s). This conclusion serves as the basis for the discussion in chapter 6 on whether a cross-border transfer of control affects the ability to use an International Telecommunications Union (ITU) filing for frequency and orbital position use.

Chapter 6 first sets out the background of the ITU, then focuses on how the filing system might affect the change of ownership of the object. Here, it is argued that it is impossible to change the filing of an orbital position internationally. However, a foreign private actor can use the original filing through an agreement with the original user, national law permitting. The overall conclusion is that the cross-border transfer of licences is legally possible with the consent of the original licensing State(s).

As national laws may be insufficient to diminish the enormous risks to humanity posed by the failure to adequately regulate space debris creation,[27] the final part of chapter 6 argues for the potential effectiveness of the ITU as a venue for facilitating consensus on an international legally binding regime. Although this could lead to a potential jurisdictional conflict between ITU and its sister UN organization, UNOOSA, the latter has shown a willingness in the past to allow other organizations, including the ITU, to issue guidelines on the subject. That said, the member States in the ITU have not yet demonstrated willingness to take on this role.

3. Literature Review

Noting that the transmission of signals is regulated in most States, the thesis focuses instead on those national laws that have the potential to include requirements to mitigate space debris and, therefore, excludes most communications laws from consideration. These purely space-oriented laws, in turn, are very limited; Frans von der Dunk estimates that only 28 States have them.[28] To obtain a representative overall picture, this thesis compares the domestic laws of nine of these States: three major space powers, namely, the US, China, and France; five smaller space-faring nations, namely, Austria, Luxembourg, Finland, Norway and Sweden; and finally Canada as representative of a group of States that only regulate remote sensing activities.[29] The content of

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[27] Note here the problems with Cosmos 954, a 'dead' satellite that crashed in northern Canada in 1978, spreading radioactive waste over 124,000 square kilometres. It shows the dangers to the Earth of decomissioned satellites that are not properly disposed of. “Previous nuclear incidents and accidents: COSMOS 954” (3 September 2019) online: *Government of Canada* <www.canada.ca/en/health-canada/services/health-risks-safety/radiation/radiological-nuclear-emergencies/previous-incidents-accidents/cosmos-954.html>.

[28] See Frans von der Dunk, *Advanced Introduction to Space Law* (Cheltenham: Elgar, 2020) at 118.

[29] Note that this will be discussed further in chapter 4.

these nine national regimes in relation to licensing and space debris is considered in detail in the succeeding chapters of the thesis.

A review of the literature on the topic is difficult, as the changing of a national licence to avoid space debris mitigation obligations has not yet been considered in any detail. Instead, this thesis examines the areas of space law relevant to the research question. The focus is on the establishment and enforcement of a licencing system for private actors that some authors connect to Article VI of the Outer Space Treaty. Paul Dempsey, for example, observes that Article VI includes the obligation of States to "authorize and continuously supervise" the space activities of non-State actors.[30] He compares the licensing requirements of different States, focusing on the extra-territorial nature of some licences.[31] Similar observations are found in Jenni Tapio's article on the new Finnish Space Act and in Setsuko Aoki's article comparing the licensing systems of three Asian States.[32]

While these articles mainly focus on a static licence, the literature has also considered a licence transfer. Petra Vorwig, for example, examines the possibility of transferring licences under US law.[33] Similarly, Tapio briefly analyses the possibility of transferring a licence to and from

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[30] See Paul Stephen Dempsey, "National Laws Governing Commercial Space Activities: Legislation, Regulation, & Enforcement" (2016) 36:1 Northwestern J of Int L & Bus 1.

[31] *Ibid.*

[32] See Jenni Tapio, "The Finnish Space Act: En Route to Promoting Sustainable Private Activities in Outer Space" (2018) 43:4 Air & Space L 387; Setsuko Aoki "Domestic Legal Conditions for Space Activities in Asia" (2019) 113 AJIL Unbound 103.

[33] See Petra A Vorwig "Regulation of Private Launch Services in the United States" in Ram Jakhu, ed, *National Regulation of Space Activities* (Dordrecht: Springer, 2010) 405.

Finland, noting the authorizations required.[34] However, as both articles show, a licence transfer depends on the national legislation in the relevant State, not international law. This idea is elaborated by Annette Froehlich and Vicent Seffinga, who compare the rules for transferring licences between different States.[35]

However, these articles do not consider the potential abuse of the system similar to maritime law; flags of convenience in space are still a relatively under-examined issue.[36] In a 2012 article, Frans von der Dunk addresses this issue.[37] He argues that the lack of a uniform international system that allows a State to be adequately compensated for damages it has had to pay under the Liability Convention opens the market to potential future problems with flags of convenience in space.[38] While part of his argument relates to private licences, the focus is more on international liability. He does not address flags of convenience in the context of the mitigation of space debris. In contrast, Paul Larsen has briefly discussed the issue in relation to space debris,[39] arguing that the possibility, of a flag of convenience, is a "weakness" of the current legal framework.[40] Both authors agree that flags of convenience in space are a possibility.

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[34] Tapio *supra* note 32.

[35] See Annette Froehlich & Vincent Saffinga, eds, *National Space Legislation: Comparative and Evaluative Analysis* (Cham: Springer, 2018).

[36] For example, the issue of flags of convenience in maritime law.

[37] See Frans von der Dunk "Toward 'Flags of Convenience' in Space?" (2012) Space, Cyber, & Telecomm L Program Fac Publications 76.

[38] *Ibid.*

[39] See Paul Larsen "Solving the Space Debris Crisis" (2018) 83:3 J of Air L & Com 475.

[40] *Ibid*.

Larsen's article, however, is an exception to the norm in the literature on space debris, which is normally a topic in and of itself. For example, a 2017 article co-written by Ram Jakhu, Yaw Nyampong and Tommaso Sgobba, describes a possible international framework for mitigating space debris.[41] In developing their framework, they primarily consider the liability implications of active debris removal.[42] They argue that it should only be done with a special licence, which should be issued by the State in which the object is registered.[43] Frans von der Dunk, on the other hand, argues in his 2020 book that the current soft law instruments for debris removal, such as the IADC's mitigation guidelines, are sufficient.[44] Steven Freeland and Lucy Stewardson similarly examine the current international framework of space debris removal.[45] In contrast to the international focus of these three contributions, Froehlich and Seffinga compare the extent to which different States have incorporated an obligation to mitigate space debris into their national laws.[46] Similarly, Micheal Byers and Aaron Boley have invoked private law to establish such an obligation in relation to private mega-constellations.[47]

Mitigation of space debris has also, to an extent, been linked to the ITU. Larsen, for example, observes that the ITU has a vital interest in ensuring the mitigation of space debris in order to

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41 See Ram S Jakhu, Yaw Otu M Nyampong & Tommaso Sgobba "Regulatory framework and organization for space debris removal and on orbit servicing of satellites" (2017) 4:3-4 J of Space Safety Engineering 129.

42 *Ibid.*

43 *Ibid.*

44 von der Dunk *supra* note 28.

45 See Steven Freeland & Lucy Stewardson "Addressing the Inevitable: Legal and Policy Issues Related to Space Debris Mitigation and Remediation" in Matteo Madi & Olga Sokolova, eds, *Space Debris Peril,* (1st ed, Boca Raton: CRC Press, 2020) 137.

46 Froehlich & Seffinga *supra* note 35 at 174–175.

47 Byers and Boley *supra* note 21 at 89.

fulfil its regulatory goals adequately.[48] Similarly, Claudiu Mihai Tăiatu argues that the ITU is the logical choice for issuing recommendations on space debris containment, as it did for Geosynchronous orbit (GEO).[49] That said, the ITU has thus far rejected responsibility for including the issue in its mandate.[50]

4. Background to the National Regulation of Private Space Actors and Activities

4.1 The Basis of National Space Laws

Most licensing regimes for space activities are found in national space legislation. The five major UN space treaties do not directly require States to adopt national space regulations.[51] In fact, different States have chosen to regulate space activities differently, if at all.[52]

Some scholars take the view that these differences are related to the extent of private activities undertaken in a State.[53] Consider, for example, the US and India. While both countries have relatively extensive space programmes, India has no significant private activities and no separate

[48] Larsen *supra* note 39.

[49] See Claudiu Mihai Tăiatu "The Future Impact of the ITU Regulatory Framework on Large Constellations of Satellites" in Annette Froehlich, ed, *Legal Aspects Around Satellite Constellations* (Cham: Springer, 2019) 55, at 77.

[50] See "Minutes of the fifteenth Plenary meeting" (27 October 2022) online: *International Telecommunications Union Plenipotentiary Conference Bucharest 2022* <www.itu.int/md/S22-PP-C-0205/en> at 4.

[51] See Tanja Masson-Zwaan & Mahulena Hofmann, *Introduction to Space Law,* (4th ed, Alphen aan den Rijn: Wolters Kluwer, 2019) at 48.

[52] von der Dunk *supra* note 28 at 118–119.

[53] Masson-Zwaan & Hofmann, *supra* note 51 at 47.

space laws to regulate these activities.[54] On the other hand, the US, which has one of the largest markets for private space activities, arguably also has one of the most comprehensive national space laws regulating the private sector.[55] According to this argument, if the private space sector is new in a State, there may not necessarily be any legal requirements in place, such as licensing or space debris mitigation, to regulate their activities.

However, linking national space laws to the emergence of private space activities in a State oversimplifies existing national legislation. While the US, as mentioned above, has enacted legislation aimed at private space activities, this is not the case in all States.[56] States with lesser space activity and significantly fewer private space operators have enacted national laws with licensing requirements to varying degrees. For example, the two Swedish Space Acts of 1982 introduced and expanded a licensing system for space actors that was not limited to private actors.[57] These Acts were adopted four years before the launch of the first Swedish satellite in 1986, which was launched by a State-owned company.[58] Even the oldest, and possibly shortest, space law, the Norwegian Space Act, introduces a kind of licensing requirement for space

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[54] See Kumar Abhijeet "Privatisation of Space in India and the Need for A Law" in Rajeswari Pillai Rajagopalan & Narayan Prasad, eds, *Space India 2.0: Commerce, Policy, Security and Governance Perspectives* (Observer Research Foundation, printed by Mohit Enterprises, 2017) 103, at 103–104.
[55] von der Dunk *supra* note 28 at 118.
[56] Note, for example, the passage of the 2015 US Commercial Space Launch Competitiveness Act, which is designed to "facilitate a pro-growth environment for the developing commercial space industry by encouraging private sector investment and creating more stable and predictable regulatory conditions, and for other purposes." *US Commercial Space Launch Competitiveness Act* (Nov 25 2015), PL 114-90, preamble (United States) [*US Commercial Space Launch Competitiveness Act*].
[57] See *Lag om rymdverksamhet*, 1982:963 (Sweden) [*Swedish Space Act 1*]; *Förordning om rymdverksamhet* 1982/1069 (Sweden) [*Swedish Space Act 2*].
[58] See Nina Wormbs & Gustav Källstrand "Short History of Swedish Space Activities" (2007) at 23, online (pdf): *European Space Agency Publications Division*, <www.esa.int/esapub/hsr/HSR_39.pdf>.

actors.[59] Since this law was passed two years after the adoption of the Outer Space Treaty, the negotiations for which questioned the possibility of private space actors, it is difficult to connect it to the presence of private actors in Norway's space industry.[60]

Moreover, none of the governmental authorities that have the right to issue licences are the ones that traditionally carry out space activities on behalf of the relevant State. For example, in Austria, the Federal Minister for Transport, Innovation and Technology issues the licence, not the Austrian Space Agency.[61] The Norwegian law simply refers to the responsible ministry.[62] This suggests that the space agencies might not be exempted from acquiring a licence unless specifically qualified as in the case of Canada's Remote Sensing Space Systems Act:

> The Governor in Council may make an order with respect to a remote sensing space system operated by the Department of National Defence or the Canadian Space Agency providing that this Act and the regulations apply to that system only in the manner and to the extent provided for in the order. The order may adapt any of the provisions of this Act or the regulations for the purposes of that application.[63]

Finally, the definition of operator in the legislation of different States is not limited to private actors. France's Space Act, for example, states that:

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[59] See Alla Pozdnakova "The new Norwegian space law: work in progress" (2020) 551 Marlus Simply 105 at 105; *Lov om oppskyting av gjenstander fra norsk territorium m.m. ut i verdensrommet*, 1969, (Norway)[*Norwegian Space Act*].

[60] Von der Dunk *supra* note 13. Since then, Norway has not passed any legislation, although there have been recent discussions about updating the existing Space Act. Pozdnakova *supra* note 59, 105.

[61] See *Weltraumgesetz,* 2011/132 at s 3 (Austria) [*Austrian Space Act*]; "Aeronautics and Space Agency" (2005-2022) online: *The Austrian Research Promotion Agency*, <www.ffg.at/en/content/aeronautics-and-space-agency-0>.

[62] *Norwegian Space Act*, *supra* note 59.

[63] See *Remote Sensing Space Systems Act,* SC 2005, c 45, s 4(2) (Canada) [*RSSSA*].

> The term "space operator", thereafter referred to as "the operator": means any natural or juridical person carrying out a space operation under its responsibility and independently.[64]

Similarly, Austria's Space Act provides that:

> "Operator" means a natural or legal person who carries out or arranges for the carrying out of space activities.[65]

In sum, although some States may decide to enact legislation regulating the operation of private space activities specifically, there is not necessarily a direct link between the enactment of such legislation and the existence of private space activities in the enacting State. Therefore, the concern mentioned above with the absence of legislation regulating private actors in a State in which private space activities only recently emerged does not necessarily arise. However, while the national legislation of States often applies to both public and private operators, there are exceptions. For example, the US Commercial Space Launch Competitiveness Act of 2015 only requires private actors to obtain a licence for space operations.[66]

Article VI of the Outer Space Treaty makes States responsible for national space activities and requires "authorization and continuing supervision by the appropriate State."[67] Article VI has been cited as the basis for the enactment by States of laws regulating national space activities. UN Resolution 68/74, for example, explicitly recommends that national regulatory frameworks should require space activities to be authorized "by a competent national authority" and that the

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[64] See *LOI no 2008- 518 du 3 juin 2008 relative aux opérations spatiales, JO, 4 June 2008, no 0129* at art 1(2) (France)[*French Space Act*], [translated by Philippe Clerc and Julien Mariez, 34 Journal of Space Law 453].
[65] *Austrian Space Act supra* note 61 at s 2(3) [translated by author].
[66] *US Commercial Space Launch Competitiveness Act supra* note 56.
[67] Outer Space Treaty, *supra* note 13 at art VI.

conditions and procedures for authorization "should be set out clearly within the regulatory framework,"[68] not limiting it to private activities.

Similarly, the requirement in Article VI for "authorization and continuing supervision by the appropriate State" has been interpreted as the basis for national licencing regimes.[69] Paul Dempsey, for example, argues that Article VI require States to regulate national space activities[70] and that the obligation of the appropriate States to authorize and supervise on an ongoing basis "requires the establishment [of] a licensing and regulatory regime under domestic law."[71]

This interpretation is supported by national space legislation. Canada, for example, requires an operating licence for any remote sensing activity in its Remote Sensing Space Systems Act (RSSSA).[72] Austria's Space Act is even more explicit in providing that no space activity may be carried out without a licence from the competent authorities.[73] Similar formulations can be found in the national legislation of Finland, Norway, Sweden, France and Luxembourg, the latter using the term authorization rather than licence.[74]

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[68] See Resolution adopted by the General Assembly, *Recommendations on national legislation relevant to the peaceful exploration and use of outer space* (11 December 2013) GA res 68/74*,* s 3.
[69] Dempsey, *supra* note 30 at 6.
[70] *Ibid* at 14.
[71] *Ibid.*
[72] *RSSSA supra* note 63 at s 5.
[73] *Austrian Space Act*, *supra* note 61 at s 3.
[74] See *Act on Space Activities* (63/2018) (Finland) [*Finnish Space Act*]; *Norwegian Space Act supra* note 59; *Swedish Space Act 1*, *supra* note 57 at s 2; *French Space Act supra* note 64 at art 2; *Loi du 15 décembre 2020 portant sur les activités spatiales et modifiant: 1. La loi modifiée du 9 juillet 1937 sur l'impôt sur les e 2 la loi modifiée du 4 décembre 1967 concernant,* at art 5(1) memorial A1086, N° doc parl 7317 (Luxembourg) [*Luxembourg Space Act*].

Nevertheless, not all States have enacted a comprehensive national regulatory framework or implemented a licensing system. In Germany, for example, there is no legislation for space activities unrelated to remote sensing.[75] China has only issued "two low-level administrative regulations addressing the issues of launching and registration of space objects so far."[76] Although, the problem in the case of China seems to be more the low level at which the regulations have been implemented rather than the absence of a regulatory framework.[77] Interestingly, similar to the US, the Chinese regulations apply to private actors only.[78]

4.2 The Meaning of "National Activities" in Article VI

Justifying national licensing regimes on the basis of Article VI requires examining their scope in relation to two concepts used in that Article. The first is "national activities." Tanja Masson-Zwaan and C.M. Jorgensen discuss what is meant by national activities in relation to space tourism and conclude that the operation of a commercial space line would fall under this definition.[79] Interestingly, they relate national activities directly to licensing.[80] Du Li highlights

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[75] See "Space Law" (3 May, 2023) online: *German Federal Foreign Office* <www.auswaertiges-amt.de/en/aussenpolitik/themen/-/231384>; "National Data Security Policy for Space-Based Earth Remote Sensing Systems" (15 April 2008) online (pdf): *German Federal Ministry of Economics and Technology* <www.bmwk.de/Redaktion/DE/Downloads/S-T/satdsig-hintergrund-en.pdf?__blob=publicationFile&v=1>.

[76] See Fabio Tronchetti "Space Law and China" (2019) in Oxford Research Encyclopedias, Planetary Science, <doi.org/10.1093/acrefore/9780190647926.013.66>.

[77] *Ibid.*

[78] See *Interim Measures on the Administration of Licensing the Project of Launching Civil Space* (2002) at art 1 (China) [*Chinese Launch Act*].

[79] See Tanja Masson-Zwaan & C M Jorgensen "Article VI of the Outer Space Treaty and Private Human Access to Space" in C M Jorgenson, ed, *Proceedings of the International Institute of Space Law 2008: 51st Colloquium on the Law of Outer Space* (USA: American Institute of Aeronautics and Astronautics, 2009) 536.

[80] *Ibid*.

the more general problems with the term national activities.[81] In an article on cyberspace, Li makes a connection between national activities and Article VI's extension of State responsibility to activities undertaken by non-State actors, observing that other international regimes do not similarly hold States responsible for the actions of private operators.[82] While this is an interesting discussion, this chapter will look at the issue from a more practical perspective. It will focus on what activities require authorization under national laws and show how different States have interpreted their obligations under Article VI.

Looking at the licensing requirements and the definition of 'national activities' in different States' laws, two ends of the spectrum can be compared. At one end, only the launch is regulated. This is illustrated by the Norwegian law, which provides that:

> It is forbidden to launch an object into space without the permission of the relevant authority.[83]

Chinese space law is similarly limited. The 2002 "Interim Measures on the Administration of Licensing the Project of Launching Civil Space" only regulates the launch of objects, not the operation of these objects after launch.[84] The same limitation is found in Australian law.[85]

At the other end of the spectrum are national laws in which activities are defined more broadly. Sweden's Space Act, for example, applies the licensing requirement to:

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[81] See Du Li "Cyber-attacks on Space Activities: Revisiting the Responsibility Regime of Article VI of the Outer Space Treaty" (2023) 63 Space Pol'y 1.
[82] *Ibid*.
[83] *Norwegian Space Act supra* note 59 at s 1 [translated by author].
[84] Tronchetti, *supra* note 76.
[85] See Joel Lisk & Melissa de Zwart "Watch This Space: The Development of Commercial Space Law in Australia and New Zealand" (2019) 47:3 Federal Law Review 444, at 447.

> Apart from those activities that completely take place in outer space, outer space activities also include the launch of space objects as well as all measures taken to manoeuvre or in any other way affect a launched space object.[86]

However, the Act narrows this definition by excluding the receipt of signals or information from an object in outer space and the launch of sounding rockets:

> To only receive signals or information in another form from an object in outer space does not count as an outer space activity according to this law. Neither does the launch of sounding rockets count as an outer space activity.[87]

The transmission of signals in Sweden is instead regulated by various other laws, e.g. the Electronic Communications Act of 2003.[88] Nevertheless, a Swedish company would, seemingly, need a licence for activities that are not directly related to the launch.[89] For example, the Swedish purchaser of the Marcopolo-1 satellite, having acquired it after it was already in space, would, arguably, still require a Swedish licence to operate it.[90] Similar definitions of space activities can be found in the national laws of Austria, France, Finland and the UK, which likewise focus not only on launch but also on the operation and control of the launched object in space.[91]

Between these two ends of the spectrum are States that only regulate national activities related to remote sensing activities. Canada, for example, does not have comprehensive legislation regulating space activities; the only exception is the RSSSA, which regulates both the launch and

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[86] *Swedish Space Act 1*, *supra* note 57 at s 1, [translated by author].

[87] *Ibid* [translated by author].

[88] See *Lag om elektronisk kommunikation* 2003:389*,* (Sweden) [*Swedish Communication Law*].

[89] *Ibid*.

[90] Note that Marcopolo-1 will be discussed further in the next chapter. *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space,* Sweden, ST/SG/SER.E/352, (1 February 1999) [Swedish Registration].

[91] *Austrian Space Act*, *supra* note 61 at s 2; *French Space Act supra* note 64 at art 1(2); *Finnish Space Act supra* note 74 at s 4(1); *Outer Space Act* [1986] at s 1 (United Kingdom).

operation of remote-sensing objects and data.[92] Germany, similarly, has no legislation for space activities unrelated to remote sensing.[93] This focus on remote sensing is likely directly related to national security considerations. It is, therefore, questionable whether any conclusions can be drawn about what these States consider to be national activities. Rather, it can be assumed that these States regulate their national activities inadequately. Apart from the mentioned, these States usually regulate the transmission of signals under separate laws.[94] However, most of these laws do not contain any requirements for the mitigation of space debris and are, therefore, less relevant to this thesis.

Interestingly, the US, like China, has regulated the launch of an object separately from the operation of the object in space. Under the US Code of Federal Regulations, an operator must obtain a licence issued by the Federal Aviation Administration (FAA) to launch a space object.[95] What distinguishes the US approach from the approach in other States is the inclusion of a space debris mitigation obligation in its communications licence.[96]

It is unclear when an operator needs a licence, but since most States considered have made it illegal to operate or launch without a licence, it can be assumed that the licence must be in place before the object is launched. Other activities, such as manoeuvring the space object without a licence, are also contrary to the national laws that regulate this.[97] Therefore, it can be assumed

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[92] *RSSSA supra* note 63.
[93] *Supra* note 75.
[94] See for example the *Canadian Radiocommunication Act* RSC 1985, c R-2.
[95] See *Aeronautics and Space*, 14 CFR at § 415.5 (United States) [14 CFR].
[96] This will be seen in section 4.5 of this chapter.
[97] See for example *Swedish Space Act 1*, *supra* note 57 at s 5; *Austrian Space Act*, *supra* note 61 at s 14.

that even if the object is sold after it is in orbit, the purchaser must be licenced before the object can be manoeuvred.

4.3 The Meaning of the "Appropriate State" in Article VI

As explained above, Article VI states that national activities "shall require authorization and continuing supervision by the appropriate State."[98] Given that the 'appropriate State' must authorize the activity, it is crucial to determine which State Article VI refers to, as this is the State that must issue the licence. The question of which State is the 'appropriate State' has preoccupied scholars. Mark Sundahl, for example, notes that while some authors limit the appropriate State to the launching State or the State of nationality of the responsible actor, [99] others define the term more broadly to include all States that have jurisdiction over the matter in question.[100] Micheal Gerhard, for example, considers the State exercising jurisdiction over the relevant issue to be the starting point for determining the appropriate State(s). However, he rejects the State of registry exercising jurisdiction over the object under Article VIII of the Outer Space Treaty as the appropriate State.[101] Instead, he considers the "preferred view" to be that the appropriate State is the one that has jurisdiction over the matter under international law.[102]

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[98] *Outer Space Treaty supra* note 13 at art VI.
[99] See Mark Sundahl "Legal Status of spacecraft" in Ram Jakhu & Paul Dempsey, eds, *Routledge Handbook of Space Law* (Abingdon and NewYork: Routledge, 2017) 42, at 46–47.
[100] *Ibid* at 46–47.
[101] See Micheal Gerhard "Article VI" in Stephan Hobe et al, eds, *Cologne Commentary on Space Law Vol 1* (Cologne: Carl Heymanns Verlag, 2009) 103, at 112–113.
[102] *Ibid* at 112–113.

What falls within the jurisdiction of a State under international law is a matter of dispute. Most agree that a State is competent to regulate all activities within its territory.[103] This territorial jurisdiction is reflected in national licensing requirements. All States require a licence for space activities operated from their territory. Austria's Space Act, for example, provides that:

> This law applies to space activities that are [conducted] from Austrian sovereign territory.[104]

Similar formulations can be found in the national laws of Sweden, Norway, France, Finland and Canada.[105]

The problem with basing the concept of appropriate State on jurisdiction under international law is the possible extension of national legislation to activities outside the enacting State's territorial borders. In fact, this is the approach under almost all national laws considered in this thesis. China, for example, has extended its regulations to launches outside China conducted by Chinese "natural or legal persons or other organisations."[106] Tronchetti observes that this extension is the natural consequence of a State's personal jurisdiction over its citizens under international law.[107] Similar extensions are found in Swedish law and, to some extent, Norwegian law which requires citizens to obtain permission if the launch is conducted outside any States territorial borders.[108] However, none of these States define what it means to be a citizen in the case of a legal entity compared to a natural person.

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[103] See Anders Henriksen, *International Law* (2n ed, Oxford: Oxford University Press, 2019) at 85.
[104] *Austrian Space Act*, *supra* note 61 at s 1(1).
[105] *Swedish Space Act 1*, *supra* note 57 at s 2; *Norwegian Space Act*, *supra* note 59 at s 1; *French Space Act supra* note 64 at art 2(1); *Finnish Space Act supra* note 74 at s 1; RSSSA *supra* note 63 at s 5.
[106] *Chinese Launch Act supra* note 78 [translated in AsianLii <www.asianlii.org/cn/legis/cen/laws/imotaopfcslp771/>].
[107] Tronchetti, *supra* note 76.
[108] *Swedish Space Act 1*, *supra* note 57 at s 2; *Norwegian Space Act*, *supra* note 59.

The International Court of Justice (ICJ), in the *Barcelona Traction* case, ruled that the State of incorporation, and not the State where the headquarters is located, is the State of nationality of a company.[109] This definition of nationality is reflected in the Finnish Space Act and, to a certain extent, in the requirements for the granting of an extraction licence in the Luxembourg Extraction Act.[110] However, unlike the Finnish Act, the Luxembourg Act does not limit itself to the State of incorporation but extends the licensing requirement to companies with their headquarters in Luxembourg.[111] This extension is also found in the space legislation of Austria and France.[112] Canada's remote sensing legislation further extends the licencing requirement to all companies that have a "substantial connection" with Canada in addition to applying to Canadian citizens and to "corporations that are incorporated or continued under the laws of Canada."[113]

An analogous approach is also found to a certain extent in US law, where the nationality of legal persons is determined by the State of incorporation of a company. However, in addition to applying to companies incorporated under US law, the US extends the licencing requirement to foreign companies that are owned by US nationals unless a jurisdictional agreement has been

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[109] See *Barcelona Traction, Light and Power Company, Limited (Belgium v Spain) (New Application: 1962)* Judgement [1964] ICJ Rep 6 at 44.
[110] *Finnish Space Act supra* note 74 at s 1; *Loi du 20 juillet 2017 sur l'exploration et l'utilisation des ressources de l'espace*, (Luxembourg), [*Luxembourg Extraction Act*] at art 4.
[111] *Luxembourg Extraction Act supra* note 110 at art 4.
[112] *Austrian Space Act*, *supra* note 61 at s 1(1)(3); *French Space Act supra* note 64 at art 2(3).
[113] *RSSSA supra* note 63 at s 6.

made with the foreign company.[114] In that case, the foreign company only needs a licence if it is at least 51% owned by US citizens or a company incorporated under US law.[115]

This can be contrasted with US communications legislation, which excludes foreign companies from obtaining a licence.[116] A foreign company, in this case, is defined as a company incorporated under foreign law or:

> [A]ny corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country.[117]

Thus, while all national legislation can be referred back to a State claiming jurisdiction over the matter, the scope of application varies between States. Nevertheless, it is possible to conclude that the requirement to obtain a licence extends beyond the territory of most States.

It can thus be argued that the appropriate State might be better defined than simply by reference to the State with jurisdiction. For example, Stephan Gorove and Frans von der Dunk have argued that the State that is internationally liable for damage to another State potentially caused by the space object is also the appropriate State,[118] the liable State being the launching State under

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[114] See *National and Commercial Space Programs,* 51 USC at § 904 (United States) [51 USC].
[115] *Ibid* at § 902.
[116] See *Telecommunications*, 47 USC at § 310 (United States) [47 USC].
[117] *Ibid* at § 310(b)(3).
[118] See Stephen Gorove "Liability in Space Law: An Overview Space Law" (1983) 8 Annals of Air and Space Law 373, at 377; Frans von der Dunk "Liability versus Responsibility in Space law: Misconception or Misconstruction?" (1992) Space, Cyber, & Telecomm L Program Fac Publications 21.

Article VII of the Outer Space Treaty and the Liability Convention.[119] This argument is, to some extent, supported by the use of the same word in Articles VII and VI in all authoritative language versions of the Outer Space Treaty other than the English version when describing the responsible and liable State.[120] While van der Dunk notes that equating the liable State with the appropriate State would unnecessarily confuse the situation, he observes further:

> The practicality and chance of realization of such a turnaround, both in general international law and in space law, may be a matter for discussion; the simplicity of this construction to my opinion preventing both the misconstruction of space law and the misconception of the ILC seems appealing and is certainly worth further attention.[121]

However, this simplicity is not reflected in national legislation, which specifies who needs a licence instead of simply stating that any actor, for which the State can be considered the launching State, requires a licence of that State.[122]

Instead, the licensing regimes of the various States are quite complex, with the result that a private actor may have to obtain multiple licences. This is contrary to the approach advocated by Bin Cheng.[123] Cheng considers that the term "appropriate State" is misleading. He instead uses

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[119] *Outer Space Treaty supra* note 13 at art VII; *Convention on International Liability for Damage Caused by Space Objects*, 29 March 1971, 961 UNTS 187 (entered into force 1 September 1972) [*Liability Convention*].

[120] See for example the Spanish or the French version of the *Outer Space Treaty.* "Tratado sobre los principios que deben regir la actividades de los Estados en la exploración y utilización del espacio ultraterrestre, incluso la Luna y otros cuerpos celestes" online (pdf): *United Nations Office for Outer Space Affairs* <www.unoosa.org/pdf/gares/ARES_21_2222S.pdf>; "Traité sur les principes régissant les activités des Etats en matière d'exploration et d'utilisation de l'espace extra-atmosphérique, y compris la Lune es les autres corps célestes" online (pdf): *United Nations Office for Outer Space Affairs* <www.unoosa.org/pdf/gares/ARES_21_2222F.pdf>.

[121] Von der Dunk *supra* note 118 at 368.

[122] See, for example, the discussion in chapter 5, where it is noted that some States directly consider that they should only register when they are a launching State, rather than prescribing the categories of a launching State.

[123] See Bin Cheng, *Studies in International Space Law* (New York: Oxford University Press, 1997) 609–612.

the term State concerned. He argues that this refers to all States involved in the launch or operation of the object.[124] However, he goes on to argue that there can only be one State concerned that would assume the Article VI responsibility under an agreement. The problem with this approach is that national licensing regimes overlap. For example, a company registered in Luxembourg, headquartered in Austria, controlled by Swedish and Canadian nationals and wishing to launch a remote sensing satellite from Norway would, arguably, have to obtain five different licences, so there would be five different appropriate States or States concerned rather than just one. There is currently no mechanism for most States to recognize each other's licences in their respective national laws.

While the lack of uniformity between national laws, resulting in the need for multiple licences, can generally be seen as creating unnecessary complications, it prevents the possibility of flags of convenience in outer space. This, in turn, is contrary to what Frans van der Dunk and Paul Larsen have argued.[125] Flags of convenience, which are mainly used in maritime law, refer to the registration of a vessel in a State with favourable legal rules for the activities on board.[126] This is possible in maritime law because the only requirement for registering a vessel is a connection between the vessel and the State of registration.[127] In comparison, while State jurisdiction over space objects is also acquired through registration, the operator's actions are regulated by licensing.[128] Thus, to obtain favourable conditions for the operation, the operator would have to

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[124] This is to some extent supported by the national provisions discussed in the previous section.
[125] Von der Dunk *supra* note 37; Larsen *supra* note 39.
[126] See Valerie Epps & Lorie Graham, *International Law,* 2nd ed (New York: Wolters Kluwer, 2015) at 375.
[127] See *United Nations Convention for the Law of the Sea,* 10 December 1982, 1833, 1834, 1835 UNTS 3, at art 91, (entered into force 16 November 1994).
[128] *Outer Space Treaty supra* note 13 at art VIII.

obtain a licence in a favourable State. The fact that the legal launch is only possible with a licence makes the possibility of flags of convenience in space depending on whether obtaining a more advantageous licence is possible after the object is already in space. It can thus be concluded that while there is no uniform consensus among States on when a private actor needs a licence, the extension of national licensing laws to domestic actors prevents a preliminary abuse of the system before launch.

4.4 The State of Registration of an Object and its Connection with the Licencing State

In space law, State responsibility for a space object is directly attributed to a particular State and is not tied to the State of registration. In contrast, in civil aviation and maritime law, the State in which the object is registered bears some responsibilities for the object[129] However, States are not necessarily responsible for the unlawful acts of the object's operator, which requires "effective control" under customary international law.[130] Therefore, in no area of law other than space law is there any consideration of the relationship between the State of registration and the responsible State.

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[129] In aviation law, for example, the State of Registry is made responsible for the safety of the aircraft through various considerations under the Chicago Convention, such as the issuance of an 'airworthiness certificate' to determine the ability of the aircraft to fly safely. *Convention on International Civil Aviation,* 7 December 1944, 15 UNTS 295, at art 31 (entered into force 4 April 1947).

[130] See *Military and Paramilitary Activities in and against Nicaragua (Nicaragua v United States of America)* Judgement [1986] ICJ rep 14, at para 115.

Even in space law, this issue has rarely been addressed. Paul Dempsey, for example, when considering registration in the context of responsibility, merely states that registration of a space object is essential.[131] Jenni Tapio addresses the issue in the specific context of the Finnish Space Act.[132] She notes that in Finland, the same governmental body is responsible for licensing and registering space objects.[133] She goes on to argue that Finland has ratified the Registration Convention because it has enacted a domestic law that essentially provides for a licensing regime.[134] However, these two authors do not show how registration is related to responsibility and licencing but only indicate that they might be linked.

While Article VI of the Outer Space Treaty imposes responsibility on a State for national activities in space, Article VIII establishes the jurisdiction of a State over any space object entered in its registry.[135] The link between the articles can be direct or indirect.

First, the direct connection: when asked what is meant by the appropriate State, in the context of the requirement for authorization and continuing supervision in Article VI the answer is that the appropriate State is the one that has jurisdiction over the matter. Since the State of registration automatically has jurisdiction over any object it registers, the apparent conclusion is that the State of registration must authorize the activity.[136] However, this is not supported by the literature and national legislation: Gerhard rejects the conclusion that the State of registration is the

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[131] Dempsey, *supra* note 30.
[132] Tapio *supra* note 32.
[133] *Ibid.*
[134] *Ibid.*
[135] *Outer Space Treaty supra* note 13 at art VIII.
[136] *Ibid* at art VIII.

appropriate State, and national laws do not explicitly require the operator of an object registered on a State's register to obtain a licence from that State.

Second, the State of registration may be the same as the State licencing the activity, even if it is not the appropriate State. This takes into account the difference between the object and its operator and, at the same time, shows the possible link between the two. The obligation to register a space object is further elaborated in the Registration Convention.[137] Article I(c) of the Convention defines the State of registration as the "launching State on whose registry a space object is carried."[138] As mentioned above, van der Dunk and Gorove argue that the launching State should also issue the licence.[139] Therefore, the launching State could be considered responsible and liable in addition to the State of registration.

A launching State is defined in both the Liability Convention and the Registration Convention as the State that launches the object, that launches the object from its territory or launching base, or that procures the launch.[140] These categories for the launching State can be compared to the appropriate State discussed in the previous section. All States require a licence to launch an object from their territory, which presumably extends to launching at their launching sites outside their territory, thus fulfilling two of the possibilities for being classified as a launching State. In addition, most national laws extend the licence requirement to their nationals so that the licence

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[137] See *Convention on Registration of Objects Launched into Outer Space,* 14 January 1974, 1023 UNTS 15 (entered into force 15 September 1976) [*Registration Convention*].
[138] *Ibid* at art I(c).
[139] Von der Dunk *supra* note 118; Gorove *supra* note 118.
[140] *Registration Convention supra* note 137 at art I(a); *Liability Convention supra* note 119 at art I(c).

requirement also applies to activities where the State can be presumed to have launched the object or to have procured the launch. Therefore, a link between a licensing State and the State of registration can be established.

There are two issues with this conclusion.

First, the discrepancy between the duty to licence and the duty to register must be noted. Article II of the Registration Convention makes it clear that only one State may register the object:[141]

> 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 […][142]

In comparison, as shown, an operator is potentially required to obtain licences from multiple States to operate their space object. Thus, more States may have issued licences than can register the object. Nevertheless, about 36 objects are dually registered in the UN registry, bridging the gap between the multiple States issuing licences and the State where the object is registered.[143]

Second, the mere fact that the same State carries out both registration and licensing does not mean that there is a relationship between the two. As practice shows, the State where registration of a space object takes place is not necessarily the State best placed to oversee its operation. For

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[141] *Registration Convention supra* note 137 at art II.

[142] *Ibid* at art II.

[143] See "Online Index of Objects Launched into Outer Space" (2023, accessed 27 May 2023) online: *United Nations Office for Outer Space Affairs* <www.unoosa.org/oosa/osoindex/search-ng.jspx?lf_id= > (entries to dually registered objects).

example, the Oreol 1 satellite was operated by France but registered in the Soviet Union.[144] While this object was launched before the French Space Act was passed and thus before the requirement for a French licence, it shows that the State of registration of the object does not necessarily equate to the appropriate State licensing its operation. Other examples include the Helios-2 satellite, which was a joint venture between Germany and the US but was only registered in the US registry, and the Hermes satellite, which was registered in the US but operated by Canada.[145] Although these objects were not operated by private actors, the consideration that none of these States of registry are appropriate to "continuously supervise" the operator in these cases highlights the question of whether the registry State is also the appropriate State.[146]

It can thus be concluded that while the State granting the licence is usually the same as the State of registration, there is not necessarily a link between the two. Rather, the licencing State regulates the object's operator, while the State of registration regulates the object itself. This could lead to conflicting national requirements for the mitigation of space debris. This, in turn, raises the question of whether it makes sense to change a licence to avoid the mitigation of space debris when the operator is subject to that obligation anyway because the object in question is

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144 See *Information Furnished in Conformity with General Assembly Resolution 1721 B (XVI) by States Launching Objects into Orbit or Beyond*, Soviet Union, A/AC.105/INF.243 (24 January 1972) , at 4.

145 See *Information Furnished in Conformity with General Assembly Resolution 1721 B (XVI) by States Launching Objects into Orbit or Beyond,* United States of America, A/AC.105/INF.342 (31 January 1976), at 2; "Helios 2" (1 March 2019) online: *Solar system exploration*, *National Aeronautics and Space Administration* <solarsystem.nasa.gov/missions/helios-2/in-depth/>; "Hermes Communications Technology Satellite" (5 February 2001) online: *Friends of CRC* <www.friendsofcrc.ca/Projects/Hermes/hermes.html>.

146 *Ibid*.

registered in the original licensing State.[147] For this reason, this thesis examines in chapter 5 not only whether it is possible to change the licencing State but also whether it is possible to change the State of registration of the object in question.

4.5 The Regulation of Space Debris Mitigation

While there is no direct obligation under international law for States to mitigate space debris, Jinyuan Su has argued that Article IX of the Outer Space Treaty indirectly obliges States to do so.[148] Article IX requires States to "pursue studies of outer space …and conduct exploration of them so as to avoid their harmful contamination … and, where necessary, . . . adopt appropriate measures for this purpose."[149] While the Article is vague as to what might fall within the concept of "harmful contamination," Su argues that the ordinary meaning of these words includes space debris.[150] That said, Article IX does not prohibit States from engaging in activities that might result in space debris, as it goes on to say:

> If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, including the moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment.[151]

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[147] For example, the UK restriction on space debris is part of the licence, as shown in Scedule 1 on licence conditions, s 1(g). This can be compared to the Chinese space debris guidelines which are not part of the licence system, as will be shown in the next section. Space Industry Act [2018] at schedule 1, s 1(g) (United Kingdom) [*UK Space Act*].

[148] See Jinyuan Su "Control over activities harmful to the environment" in Ram Jakhu & Paul Stephen Dempsey, eds, *Routledge Handbook of Space Law* (Abingdon and NewYork: Routledge, 2017) 73.

[149] *Ibid.*

[150] Su, *supra* note 148.

[151] *Outer Space Treaty supra* note 13 at art IX.

As such, it can be concluded that no provision of the Outer Space Treaty directly obliges States to mitigate the creation of space debris.

While there is no internationally binding legal obligation, States have committed themselves through multilateral soft law initiatives to mitigating the creation of space debris. As mentioned earlier, the UNCOPUOS has issued guidelines on mitigating space debris. The ITU has also issued recommendations for "Environmental protection of the Geostationary-Satellite Orbit," which "provides guidance about disposal orbits for satellites in the geostationary-satellite orbit and comments on the increase in debris […]."[152] Outside the UN, some States have formed the IADC, an intergovernmental committee of national space agencies to coordinate the global fight against space debris.[153] The IADC's membership includes, notably, the space agencies of China, and the US, the Indian Space Research Organisation and Roscosmos.[154] The IADC can thus be considered relatively successful in uniting the world's largest space agencies in combating space debris.

The IADC has issued the best-known guidelines for mitigating space debris.[155] The guidelines divide the requirements for mitigation of space debris according to which orbit the object is in.[156] For example:

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[152] See "Environmental protection of the geostationary-satellite orbit" Recommendation S.1003-2 (12/2010) online: *International Telecommunications Union* <www.itu.int/rec/R-REC-S.1003-2-201012-I/en> [ITU Space Debris Mitigation Guidelines].
[153] See "What`s IADC" (2019) online: *Inter-Agency Space Debris Coordination Committee* <www.iadc-home.org/what_iadc>.
[154] See "IADC, Member Agencies" (2019) online: *Inter-Agency Space Debris Coordination Committee* <www.iadc-home.org/> [IADC Membership].
[155] Inter-Agency Space Debris Coordination Committee *supra* note 19.
[156] *Ibid*.

> Spacecraft or orbital stages that are terminating their operational phases in orbits that pass through the LEO region [(Lower Earth Orbit region)], or have the potential to interfere with the LEO region, should be de-orbited (direct re-entry is preferred) or where appropriate manoeuvred into an orbit with an expected residual orbital lifetime of 25 years or shorter.[157]

In this example, the success of the mitigation must be at least 90%.[158] The IADC Guidelines formed the basis for the UNCOPOUS Guidelines on the same subject, albeit that neither is legally binding.[159]

Having established that some States have committed themselves through the IADC and UNCOPUOS Guidelines to mitigating space debris, it is not surprising that member States require in their licensing regimes that the object be disposed of at the end of its functional life. Canada, for example, requires that the operator submit a plan for the disposal of the object before a licence is granted.[160] The UK has also included the condition that space debris must be disposed of in the Annex listing the conditions for issuing the licence.[161] Tronchetti notes that China has done likewise:

> The 2010 Space Debris Interim Instrument has been enacted to enable the domestic implementation of a series of international technical standards and recommended practices aimed at reducing the pollution of the space environment during the launch, operation, and disposal of a space object, and at diminishing the likelihood of accidents.[162]

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[157] *Ibid* at ch 5(3).
[158] *Ibid;* Also note that most planned mega-constellations are found in LEO.
[159] Su, *supra* note 148 at 76; "Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space" (2010) online (pdf): *United Nations Office for Outer Space Affairs* <www.unoosa.org/pdf/publications/st_space_49E.pdf>.
[160] *RSSSA supra* note 63 at s 9.
[161] *UK Space Act supra* note 147 at schedule 1, s 1(g).
[162] Tronchetti, *supra* note 76.

Among these practices is the requirement to dispose of the item at the end of its life.[163] It should be noted that the Chinese requirements are, arguably, not part of the licence itself, as is the case with the other national regimes mentioned above. Thus, the obligation to mitigate space debris under Chinese law is arguably linked to the registration of the object in China rather than the fact that the operator holds a Chinese licence.

In the 2015 Commercial Space Launch Competitiveness Act, the US specifically referenced the need for a space debris mitigation study, including:

> A review of all space traffic management and orbital debris requirements under treaties and other international agreements to which the United States is a signatory, and other nonbinding international arrangements in which the United States participates, and the manner and extent to which the Federal Government complies with those requirements and arrangements.[164]

However, the obligation to dispose of the object is a condition of a US communications licence.[165] The Federal Communications Commission (FCC), the body which grants communications licences, announced a reduction in time, in 2022, of the requirement to dispose of an object at the end of its life from 25 years to 5 years, illustrating the increasing importance the US attaches to mitigating the creation of space debris.[166]

Considering that the IADC Guidelines formed the basis for the UNCOPUOS Guidelines, it is not surprising that concerns with protecting the orbital environment from space debris are extended

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[163] *Ibid.*
[164] US Commercial Space Launch Competitiveness Act, *supra* note 56.
[165] 47 USC *supra* note 116 at § 25.283.
[166] See Will Wiquist "FCC Adopts new '5-year rule' for deorbiting satellites to address growing risk of orbital debris" (29 September 2022) online (pdf): *Federal Communications Commission* <docs.fcc.gov/public/attachments/DOC-387720A1.pdf >.

beyond the IADC membership. Austria, for example, obligates the operator to take "appropriate precautions for the avoidance of space debris" as a condition for granting the licence.[167] Similarly, Australian law requires the operator to have a mitigation plan to obtain its licence.[168]

In contrast, some older space laws, such as the Swedish and Norwegian laws, do not include space debris mitigation provisions.[169] However, the Swedish law provides for the possibility of adding conditions to the Swedish licence:

> An authorisation may be limited in such a way as is appropriate in the circumstances. It may also be subject to such conditions as are necessary for the control of the activity or for other reasons.[170]

Some have argued that the general language of this provision may allow for the inclusion of a space debris mitigation requirement in the licence.[171]

More interesting are the requirements in the more recent national laws. For example, France requires the operator to protect the environment in space.[172] However, its law does not directly require an 'end-of-life' plan for space debris, even though France is a member of IADC.[173] Although, France later issued Technical Regulations for Space Activities,[174] requiring an Environmental Impact Assessment, which obliges the operator to prepare a plan to mitigate the generation of space debris. Luxembourg, although also not a member of the IADC, similarly

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[167] IADC Membership *supra* note 154; *Austrian Space Act*, *supra* note 61 at s 4(4) [translated by author].
[168] See *Space (Launches and Returns) Act* [2018] at s 34 (Australia) [*Australian Space Act*].
[169] *Norwegian Space Act supra* note 59; *Swedish Space Act 1*, *supra* note 57; *Swedish Space Act 2*, *supra* note 57.
[170] *Swedish Space Act 1*, *supra* note 57 at s 3.
[171] Froehlich & Seffinga *supra* note 35 at 174.
[172] *French Space Act supra* note 64 at s 4.
[173] *Ibid* at s 4; IADC Membership *supra* note 154.
[174] Froehlich & Seffinga *supra* note 35 at 85.

obliges the responsible minister to take the necessary measures to protect the space environment,[175] although it is not clear whether these measures include the mitigation of space debris.

5. National Law Barriers to the Avoidance of Space Debris Mitigation Obligations by Licencees

5.1 The Transfer of Registration of a Launched Object to a non-Launching State

The transfer of registration of a space object is generally a less contentious issue than the transfer of licences. However, considering the issues raised in the previous chapter, this chapter begins by addressing changes in the State of registration of a space object.[176] That the registration of an object can be transferred to a different State[177] is illustrated by the transfer of the registration of four satellites in 1998 from the UK's register to the Chinese register after Hong Kong was returned to China.[178] AsiaSat 1, AsiaSat 2, APSTAR-I and APSTAR-IA were satellites launched from China for a Hong Kong company when Hong Kong was still part of the UK and registered

[175] *Luxembourg Space Act supra* note 74 at s 9(2).
[176] For example, the Chinese mitigation requirements as discussed in chapter 4.5.
[177] See Frans von der Dunk "Transfer of Ownership in Orbit: from Fiction to Problem" in Mahulena Hofmann & Andreas Loukakis, eds, *Ownership of Satellites:4th Luxembourg Workshop on Space and Satellite Communication Law* (Baden-Baden: Nomos Verlagsgesellschaft, 2017) 29, at 29–31.
[178] See Upasana Dasgupta, "On-Orbit Transfer of Satellites between States: Legal Issues-with Special Emphasis on Liability and Registration" (2016) International Institute of Space Law Proceedings 2016 1, at 9.

on the UK register.[179] In 1998, after Hong Kong was returned to China, the UK cancelled the registrations so that China could register the satellites.[180]

The question is, therefore, not whether a registration can be transferred but rather to which State it can be transferred.[181] The Registration Convention does not expressly contemplate a transfer but it can provide implicit guidance.[182] For example, the Convention provides that a State of registration is "a launching State on whose registry a space object is carried …"[183] This gives the impression that a State party to the Convention can only register an object if it is 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."[184] This would restrict the possible registration to the register of the same States that grant the original licence(s).[185]

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[179] See *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, United Kingdom, ST/SG/SER.E/222 (15 May 1990); *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, United Kingdom, ST/SG/SER.E/300 (23 January 1996); *United Kingdom of Great Britain and Northern Ireland Letter dated 21 October 1996 from the Permanent Mission of the United Kingdom of Great Britain and Northern Ireland to the United Nations (Vienna),* United Kingdom, ST/SG/SER.E/316 (21 October 1996).
[180] See *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, United Kingdom, ST/SG/SER.E/333 (27 March 1998); *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, China, ST/SG/SER.E/334 (27 March 1998).
[181] Please note that a transfer of registration is considered a deregistration in the original State and a re-registration in the new State.
[182] See Armel Kerrest " Legal Aspects of Transfer of Ownership and Transfer of Activities" in Mahulena Hofmann & Andreas Loukakis, eds, *Ownership of Satellites:4th Luxembourg Workshop on Space and Satellite Communication Law* (Baden-Baden: Nomos Verlagsgesellschaft, 2017) 75, at 79.
[183] *Registration Convention supra* note 137 at art I(c).
[184] *Ibid* at art I(a).
[185] Note the discussions on this topic in chapter 4.4.

This interpretation is supported by Bernhard Smidt-Tedd and Martin Reynders, who argue that Article II of the Registration Convention prohibits a non-launching State from registering the relevant object:[186] Article II states that:

> 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.[187]

Smidt-Tedd and Reynders thus interpret the launching State's obligation to register an object once it is launched to mean that only the launching State can register the object. Similarly, Michael Chatzipanagiotis argues that the wording of Article 1(c) of the Registration Convention prevents non-launching States from registering the object.[188] However, Chatzipanagiotis later concedes that a holistic approach would allow the transfer of registration to a non-launching State.[189]

The problem with these arguments is twofold.

First, as mentioned in the previous chapter, registration is essential for jurisdiction over the space object. Both of the articles mentioned in the above paragraph draw a connection between the launching State and the State with jurisdiction over the object.[190] The problem with this conclusion is that the jurisdiction over registration of the object is only set out in the Outer Space

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[186] See Bernhard Schmidt-Tedd & Martin Reynders "Cross-Border Transfer of Operation (Ownership) of Satelites" in Mahulena Hofmann & Andreas Loukakis, eds, *Ownership of Satellites:4th Luxembourg Workshop on Space and Satellite Communication Law*(Baden-Baden: Nomos Verlagsgesellschaft, 2017) 65 at 72.
[187] *Registration Convention supra* note 137 at art II.
[188] See Micheal Chatzipanagiotis "Registration of Space Objects and Transfer of Ownership in Orbit" 56:2 Zeitschrift für Luft- und Weltraumrecht 229.
[189] *Ibid.*
[190] Schmidt-Tedd & Reynders *supra* note 186; Chatzipanagiotis *supra* note 188.

Treaty and not in the Registration Convention.[191] Rather, the Registration Convention clarifies in the preamble that it establishes a registration system "to provide for States Parties additional means and procedures to assist in the identification of space objects."[192]

Therefore, when considering State jurisdiction over an object, the wording of Article VIII of the Outer Space Treaty must be considered. Following the rules on treaty interpretation in the Vienna Convention on the Law of Treaties (VCLT), it is clear that the State having jurisdiction over an object is not limited to the launching State.[193] According to the VCLT, a treaty shall be interpreted 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."[194] The ordinary meaning of the words of Article VIII – "[a] State Party to the Treaty on whose registry an object launched into outer space is carried " – does not include the limitation that the State of registration must be a launching State.[195]

Under the VCLT, it is possible to interpret a treaty by reference to agreements relating to the treaty between State parties. However, these are limited to the following:

> [A]ny agreement relating to the treaty which was made between all the parties in connection with the conclusion of the treaty[…and] any instrument which was made

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[191] *Outer Space Treaty supra* note 13 at art VIII; *Registration Convention supra* note 137.
[192] *Registration Convention supra* note 137.
[193] It should be noted that the Vienna Convention does not apply retroactively, but the International Court of Justice has applied the rules of interpretation in this respect, which shows that it is customary international law. Anthony Aust "Vienna Convention on the Law of Treaties (1969)" (2006) in MPEPIL, at para 15.
[194] See *Vienna Convention on the Law of Treaties,* 23 May 1969, 1155 UNTS 331, art 31, (entered into force 27 January 1980) [*VCLT*].
[195] *Outer Space Treaty supra* note 13 at art VIII.

> by one or more parties in connection with the conclusion of the treaty and accepted by the other parties as an instrument related to the treaty.[196]

Neither of these categories applies in the present context.[197] The argument put forward by Chatzipanagiotis, Smidt-Tedd and Reynders that only a launching State can acquire jurisdiction over an object is, therefore, contrary to the established rules of treaty interpretation. Nonetheless, the obligation set out in the Registration Convention may limit the consideration of which State can obtain jurisdiction over the subject matter to those States that are parties to the Registration Convention.[198]

Second, even for the State parties to the Registration Convention, the launching State limitation on the transfer of registration is questionable. Under the VCLT, the practice of States can assist in interpreting a treaty provision; in this case, State practice indicates the possibility that an object can be re-registered in a non-launching State.[199] In 1989, British Satellite Broadcasting Ltd. launched a satellite called Marcopolo-1 from Cape Canaveral in the US.[200] The UK entered

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[196] *VCLT supra* note 194 at art 31.

[197] Note that the Registration Convention was not an agreement between the parties at the time of the conclusion of the Outer Space Treaty but rather a separate treaty, partly independent of the Outer Space Treaty, which is visible when noting that the parties to both conventions. For example, Algeria has ratified the Registration Convention but not the Outer Space Treaty. "Convention on registration of objects launched into outer space" (27 July 2023) online: *United Nations Treaty Collection* <treaties.un.org/Pages/ViewDetailsIII.aspx?src=TREATY&mtdsg_no=XXIV-1&chapter=24&Temp=mtdsg3&clang=_en> ; "Treaty on principles governing the activities of States in the exploration and use of outer space, including the moon and other celestial bodies" (27 July 2023) online: *United Nations Treaty Collection* <treaties.un.org/pages/showdetails.aspx?objid=0800000280128cbd>.

[198] Note that the Registration Convention has 72 ratifications, and thus only 72 states are obliged to register under its limits. Committee on the Peaceful Uses of Outer Space "Status of International Agreements relating to activities in outer space as at 1 January 2022" (28 March–8 April 2022) online (pdf): *United Nations Office for Outer Space Affairs* <www.unoosa.org/res/oosadoc/data/documents/2022/aac_105c_22022crp/aac_105c_22022crp_10_0_html/AAC105_C2_2022_CRP10E.pdf>.

[199] Aust *supra* note 193, at para 15.

[200] See *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, United Kingdom, ST/SG/SER.E/219 (12 April 1990) at 5.

the object into its registry and informed the UN in 1990.[201] Three years later, a Swedish company bought the object while it was still in orbit.[202] The object was renamed Sirius-1 and entered in the Swedish registry in 1999, where it can still be found today.[203] This subsequent registration shows that even a non-launching State that has ratified the Registration Convention can re-register an object.[204]

Nevertheless, State practice seems to be contradictory on this issue. Marcopolo-1 can be compared with Marcopolo-2, another satellite launched by British Satellite Broadcasting Ltd. in 1990, also from Cape Canaveral and also entered on the UK register.[205] This object, similarly to Marcopolo-1, was sold while in orbit, in this case to Norway in 1992.[206] However, unlike Marcopolo-1, Norway never re-registered Marcopolo-2.[207] These examples show that the transfer of registration to a non-launching State could potentially depend on the domestic laws of the State in question. This is supported by the Registration Convention which states in Article II(3)

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[201] *Ibid* at 5.
[202] Swedish Registration *supra* note 90.
[203] *Ibid;* Per Magnusson "Register of Swedish Objects Launched into Outer Space" (2017) online (pdf): *Rymdstyrelsen* <www.rymdstyrelsen.se/contentassets/4ec4874a900d4949a0862cdc52f95218/svenska_satellitregistret_2017_juni.pdf>.
[204] Committee on the Peaceful Uses of Outer Space *supra* note 198; also note the wording of the document showing the new Swedish registration, titled "*Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space"* Swedish Registration *supra* note 90.
[205] See *Information Furnished in Conformity with the Convention on Registration of Objects Launched into Outer Space*, United Kingdom, ST/SG/SER.E/241 (8 July 1991).
[206] See "UK Supplementary Registry of Outer Space Objects" (October 2020) at 7, online (pdf): *United Kingdom Space Agency,* <assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/925089/UK_Supplementary_Registry_of_Space_Objects_-_October_2020.pdf> [British Space Supplementary Registry].
[207] See "Online Index of Objects Launched into Outer Space" (2023, accessed 18 June 2023) online: *United Nations Office for Outer Space Affairs,* <www.unoosa.org/oosa/osoindex/search-ng.jspx?lf_id=> (entry for Marcopolo-2).

that "[t]he conditions under which [the registry] is maintained shall be determined by the State of registry concerned."[208]

While in some States, such as Canada, the obligation to register the object is not addressed, other States have regulated this as a secondary aspect.[209] Thus, two questions need to be answered when it comes to the re-registration of an object.

First, is the private actor obliged to register an object, or can it choose whether to register it or not? Second, does national law allow a State to register an object for which it was not the launching State? The answers to these two questions vary from State to State.

In contrast to the lack of legal guidance in Canada, the French Space Act indicates that it is potentially obligated to register a space object.[210] It provides that:

> In the event France has a registration obligation according to Article II of the Convention dated 14 September 1975 relating to Registration of objects launched into outer space, and, if necessary, of other international agreements, the launched space objects are registered in a registry hold by the Centre National d'Etudes Spatiales on behalf of the State, following the prescriptions set out in a decree passed at the Council of State.[211]

Two arguments can be made regarding the French law. First, there is arguably a launching State limitation on registering the object in France.[212] The above-quoted reference to a registration

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[208] *Registration Convention supra* note 137 at art II(3).
[209] *RSSSA supra* note 63; Ram S Jakhu & Aram Daniel Kerkonian, "Second Independent Review of Canada's Remote Sensing Space Systems Act" (2018-2019) 42 J Space L 1, at 17.
[210] *French Space Act supra* note 64 at art 12.
[211] *Ibid* at art 12 [translated by Philippe Clerc and Julien Mariez, 34 Journal of Space Law 453].
[212] See Yoon Lee "Registration of space objects: ESA member states' practice" (2006) 22:1 Space Policy 42.

obligation in relation to Article II of the Registration Convention implies this limitation. Second, France does not impose an obligation on private actors to register a space object and thus does not give a private actor the right to register an object on the French register.[213] Australian law similarly requires the Minister to maintain a register for objects for which it is a launching State.[214] It provides that:

> [I]f a country other than Australia is also a launching State for the space object—the name of that country.[215]

As the meaning is similar to that of France, the same conclusions can be drawn.

Other national laws are more explicit in limiting the obligation to register to objects for which the enacting State is the launching State. Austria's Space Act, for example, provides that:

> Space objects are to be entered in this register for which Austria is regarded as the launching State in accordance with Article I of the Convention on the Registration of Objects Launched into Space.[216]

Interestingly, the same limitation is found in the Swedish legislation:

> The Swedish National Space Board shall keep a register of the space objects for which Sweden is to be regarded as the launching State under Article 1 of the Convention of 14 January 1975 on the Registration of Objects Launched into Outer Space.[217]

This provision is contrary to the conclusion above that Sweden allows the registration of objects for which it is not a launching State. Furthermore, the legislation in Austria and Sweden, similar to that in France and Australia, does not oblige private actors to register objects.[218]

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[213] *French Space Act supra* note 64 at art 12.
[214] *Australian Space Law supra* note 168 at s 76.
[215] *Ibid* at s 76(2)(f).
[216] *Austrian Space Act*, *supra* note 61 at s 9(2) [translated by the author].
[217] *Swedish Space Act 2*, *supra* note 57 at s 4 [translated by the author].
[218] Again, the similarities in wording are noted when comparing with France.

In contrast, the 1986 UK law provides that the "Secretary of State shall maintain a register of space objects" to record the details of objects, "whether launched in the United Kingdom or elsewhere."[219] Again, there is no registration obligation on a private actor. However, the concluding words of the above quoted provision suggests that the UK could potentially register an object for which it is not the launching State.[220] To this extent, the UK has introduced an additional register for those objects for which it has granted a licence to operate but is not the international registration State.[221] However, as discussed in the previous chapter, it is usually the case that the original licensing State is also a launching State. It is, therefore, questionable whether the UK can register objects that it did not help launch.

Unlike the case in the UK, the laws of Luxembourg and the US obligate private operators to register the object but limit the obligation to the launch of the object. The Luxembourg legislation provides that an "operator who takes the initiative to launch" must submit the relevant information about the object to the keeper of the register, and the US legislation provides that the launch operator, i.e., "the person who conducts or who will conduct the launch,"[222] must submit information to the FAA.[223] A similar registration requirement is found in Chinese law.[224] In its second interim measure, China imposes the obligation to register objects on natural and legal persons rather than the registrar but limits it to the launching State. [225]

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[219] Outer Space Act [1986] at s 7 (United Kingdom).
[220] Lee *supra* note 212.
[221] *Ibid*.
[222] *Luxembourg Space Act supra* note 74 at art 15(2); 14 CFR *supra* note 95 at § 401.7.
[223] 14 CFR *supra* note 95 at § 417.19.
[224] Tronchetti, *supra* note 76.
[225] *Ibid*.

It could be concluded from the discussion above that it is impossible for a private actor to transfer the registration of an object to a non-launching State. That said, Marcopolo-1 was sold eleven years after the law that introduced the registration requirement was passed and seventeen years after the Registration Convention was adopted.[226] In the intervening years, its re-registration in Sweden has not been directly criticized as a violation of national or international law, suggesting that a transfer of the object to a purchaser in a non-launching State would allow that State to register the object.[227]

This conclusion is supported by the literature. Ram Jakhu, Bhupendra Jasani and Jonathan C. McDowell[228] argue that by registering the object the State assumes the role of a launching State.[229] This leads to the tentative conclusion that it is possible to change the registration of a satellite. In this context, it should be noted that Marcopolo-1 was never removed from the UK register, so there was not a complete transfer of registration to the Swedish register.[230] However, the UK registration was transferred to the UK's Supplementary Register, with an indication that Sweden is the new State of registration.[231] Thus, under UK national law, the UK is no longer the

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[226] Note that the Registration Convention entered into force in 1976 and that Marcopolo-1 was purchased in 1993. Committee on the Peaceful Uses of Outer Space *supra* note 198.
[227] Note that the Registration Convention entered into force in 1976 and the satellite only appeared in the Swedish register in 1999. *Ibid*. In addition, neither Schmidt-Tedd & Reynders nor Chatzipanagiotis address Marcopolo-1 in their respective articles; only Upasana Dasgupta mentions a possible problem with the Swedish re-registration. (Dasgupta *infra* note 232).
[228] See Ram S Jakhu, Bhupendra Jasani & Jonathan C. McDowell "Critical issues related to registration of space objects and transparency of space activities" (2018) 143 Acta Astronautica 406.
[229] *Ibid.*
[230] British Space Supplementary Registry *supra* note 206 at 5.
[231] *Ibid*.

State of registration.[232] However, whether a private actor has the right to register the object is questionable, thus leaving open the question of whether a private actor can change the State of registration of an object.

5.2 The Transferability of a Licence Domestically

Before addressing the transferability of a licence to a new State, it must first be determined whether a licence transfer is possible at all. Again, national licencing regimes can be divided into two ends of a spectrum. At one end, are civil law States that either do not address the transferability of a licence or do not allow it.[233] French, Norwegian, Swedish and Austrian laws, for example, are silent on the issue.[234] In contrast, the legislation in Luxembourg refers to the personal character of the licence and describes it as non-transferable.[235]

Most of these States regulate a transfer of control of the object; however, it is questionable whether a transfer of control includes a transfer of the licence. The legislation in Austria, for example, addresses a transfer of control with reference to the provision that sets out the conditions for obtaining a licence, implying the possibility of a licence transfer included in the transfer of control of the relevant object.[236] This is supported by Annette Fröhlich and Vincent

[232] See Upasana Dasgupta "Reconciling State practise of in-orbit satellite transfer with the law of liability and registration in Outer Space" (2018) Centre for Research in Air and Space Law's Sixth Monograph titled "Global Space Governance and the UN 2030 Agenda 55, at 62.
[233] Note here that there is probably no correlation between being a civil law State and the regulation of the transfer of control; this is just a trend that makes it possible to distinguish between the two groups of States.
[234] *French Space Act supra* note 64; *Norwegian Space Act*, *supra* note 59; *Swedish Space Act 1*, *supra* note 57; *Swedish Space Act 2*, *supra* note 57 or *Austrian Space Act*, *supra* note 61.
[235] *Luxembourg Space Act supra* note 74 at art 5(5).
[236] *Austrian Space Act*, *supra* note 61 at s 8.

Seffinga, who interpret the Austrian provision to mean that the change of controller also allows for a transfer of a licence.[237] They thus essentially equate a transfer of ownership of the object with a transfer of the licence. This reasoning is questionable, as it ties the licence to the object and not to the operator.[238] Furthermore, the fact that the Austrian law does not directly provide for a licence transfer suggests that it is not possible.

At the other end of the spectrum are those common law States whose laws explicitly provide for a transfer of licenses. Australian law, for example, provides that a launch licence can be transferred to another operator, provided the Minister is notified, and the same launch facility is used.[239] A licence transfer is also possible under UK law, provided the regulatory authority agrees.[240] Interestingly, Finnish law also provides for the transferability of a licence with the consent of the competent body, setting itself apart from the other civil law States.[241]

Similar to the position in the other common law States mentioned above, a transfer of the launch licence is possible under US legislation.[242] The transfer must be approved by the FAA, and the new licensee is bound by the obligations imposed on the original licensee.[243] However, a communications licence, which includes conditions on space debris mitigation, is regulated

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[237] Froehlich & Seffinga *supra* note 35 at 90.
[238] *Ibid* at 13. The limitations of this will be discussed further in the next section. However, it should be noted that in chapter 4.4 it was argued that there was no link between registration and licensing. This is further highlighted by Micheal Gerhard "Transfer of Operation and Control with Respect to Space Objects - Problems of Responsibility and Liability of States" (2002) 51:4 Zeitschrift fur Luft- und Weltraumrecht 571, at 574.
[239] *Australian Space Law supra* note 168 at eg. s 32.
[240] *UK Space Act supra* note 147 at s 15.
[241] Tapio *supra* note 32.
[242] Vorwig *supra* note 33.
[243] *Ibid*.

similarly to the approach in the civil law States discussed above in that the legislation addresses control of the licence carrier rather than the licence itself.[244] It can thus be concluded that it is possible to transfer control of the object domestically with the consent of the competent authority. However, the transferability of the licence depends on the law of the State in which the licence was originally issued.

5.3 The Cross-Border Transferability of a Licence

In principle, transferable licences are transferable internationally under the same conditions as domestically. However, to the extent that space debris mitigation requirements are attached to the licence, a direct international transfer of a licence is not advantageous for the private actor.[245] For a private licensee to escape its obligations to mitigate space debris, it must instead be able to cancel the original licence. However, the cancellation of the licence by itself would not enable the private actor to avoid its space debris mitigation obligations since cancellation means that the private actor can no longer legally operate the object.[246] Therefore, in addition to being able to cancel the original licence, the licensee must be able to acquire a new licence in a new State.

Before considering whether this is possible, a preliminary issue must be addressed. Even if it is possible to transfer the State of registration of the relevant object, it is not necessarily also possible to transfer a licence to the new State. Fröhlich and Saffinga link the licence to the

[244] Like the transfer of control of the civil law states, this will be further addressed in the last section of this chapter. Petra A Vorwig "Regulation of Satellite Communications in the United States" in Ram Jakhu, ed, *National Regulation of Space Activities* (Dordrecht: Springer, 2010) 421.
[245] See the conclusions in chapter 4.5.
[246] This was noted in chapter 4.

object.[247] The object, in turn, is controlled by the law of the State of registration.[248] If one follows this line of reasoning, a change in the State of registration would automatically also mean a change of the licence, regardless of who the operator is. However, this conclusion is questionable when one considers the Marcopolo-2 case where a satellite launched by British Satellite Broadcasting Ltd. from Cape Canaveral and registered on the UK register was later sold while in orbit to Norway. While the appropriate State under Article VI was arguably changed to Norway, the State of registration under Article VIII was not.[249] It should be noted that the Marcopolo-2 case can only serve as a theoretical example, as the legislation in Norway does not provide for an operating licence.[250] However, if the transfer of the satellite had been to a State whose licencing laws extend to the operation of a space object, a licence under that law would have been required, thus changing or extending the appropriate State under Article VI to Norway but not changing the State of registration under Article VIII. Therefore, the cancellation of a licence and the acquisition of a new licence must be considered separately from a transfer of registration.

5.3.1 Can a Private Actor Cancel a Licence?

The question of whether a private actor can cancel a licence can be divided into three sub-questions. First, has the licence come to a natural end? If so, it can be argued that – depending on the answer to the third question – the obligations imposed on the licensee have also come to an end, and thus, there is no need to terminate the licence in order to avoid these obligations. Second, can a private actor terminate its licence under the applicable national law? Third, do the

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[247] Froehlich & Seffinga *supra* note 35 at 90.
[248] This was noted in chapter 4.
[249] As noted in the previous section, setting out the history of Marcopolo-2.
[250] See chapter 4.2 on national activities for this conclusion.

private actor's obligations under the original licence continue after the licence has been cancelled? These three questions will be addressed in turn.

The first question depends on the type of licence. Licensing regimes governing the operation of the object in orbit, such as those in Sweden and Austria, have no bearing on the first question, as these do not come to a natural end before the space debris mitigation obligation applies.[251] The focus of the first question is rather on those States that only regulate launches. At the international level, the term launch has not been defined other than to specify that it also includes an attempted launch.[252] The ordinary meaning of the term launch may, therefore, be helpful in interpreting the term. The Cambridge dictionary, for example, defines launch to mean "an occasion when … a spacecraft is sent into space…."[253] Thus, if the licence is limited to the launch, this means that the licensee's obligations are limited to the placement of the object in space.

This seems to be the case under the Norwegian regime, which does not impose obligations beyond the initial launch.[254] Similar limits are on the US launch licence, with launch defined as:

> "[L]aunch" means to place or try to place a launch vehicle or reentry vehicle and any payload or human being from Earth **(A)** in a suborbital trajectory; **(B)** in Earth orbit in outer space; or **(C)** otherwise in outer space.[255]

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[251] This was noted in chapter 4.2.
[252] *Liability Convention supra* note 119.
[253] See *Cambridge Dictionary* (2023) online: *Cambridge Dictionary* <dictionary.cambridge.org/dictionary/english/launch#> sub verbo "launch."
[254] Note the argument in chapter 4.5 about the scope of the Norwegian licence, which is not particularly relevant to space debris mitigation.
[255] 51 USC *supra* note 114 at § 50902(7).

Following the same logic, a launch licence terminates after the object has been placed in orbit and, with it, all potential space debris mitigation obligations are terminated. This conclusion is supported by the fact that, under the US licensing regime, space debris mitigation requirements are incorporated in the communications licence, not the launch licence.

This can be contrasted to the licensing regime in Australia, which instead incorporates its space debris mitigation obligations in the launch licence,[256] with the launch of a space object defined to mean:

> . . . launch [of] the whole or a part of the object into an area beyond the distance of 100 km above mean sea level, or attempt to do so.[257]

The obligations set out in the launch licence should therefore end when the object is beyond 100 km above sea level or the attempt to bring it there. Indeed, the penalties provided in the law are limited only to the launch of the object.[258] What then happens to the obligations to mitigate space debris set out in the licence is unclear but one could argue that while Australian law requires the inclusion of a space debris mitigation plan in a launch licence, the licensee is not required to act on it once the object is launched.

Although the UK licencing regime extends to the operation of the launched object, it may also be limited in time.[259] However, the UK legislation explicitly provides that the expiry of a licence does not affect the "obligations of the licensee or former licensee under the conditions of the

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[256] Note the limits set out in chapter 4. The only exception is the return of an object, which does not refer to the re-entry and disposal of an object, but rather the return, including the safe landing of it. Lisk & de Zwart *supra* note 85.
[257] *Australian space law supra* note 168 at s 8.
[258] *Ibid* at s 11.
[259] *UK Space Act supra* note 147 at s 14.

licence."[260] Thus the licensee's obligations to mitigate space debris continue to apply in the case of time-limited licences, even if the licence has technically expired.

The second question – can a private actor cancel its licence – relates to the licences that do not end naturally after launch. While it is clear that a licence can be terminated, the right to do so is usually reserved to the State. National laws usually authorize the licensing authority to suspend or revoke a licence in specified circumstances. In Canada, for example, a licence can be suspended if it endangers Canada's national security or is inconsistent with Canada's international obligations.[261] Swedish law similarly empower the licensing authority to revoke a licence:

> An authorisation may be withdrawn if the conditions of the authorisation are breached or if there are other specific reasons for doing so.[262]

Similar provisions can be found in the licencing regimes of Finland, France and Austria, which all allow the licensor to suspend or revoke the licence.[263]

On the other hand, it is highly doubtful that a private actor can revoke its licence unilaterally. The wording of the revocation provisions rather suggests the opposite. They are all worded in a way that makes revocation a penalty for breaches of the licence conditions by the licensee.[264] It would be absurd to posit that the private licensee could effectively punish itself by cancelling its

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[260] *Ibid* at s 15.
[261] *RSSSA supra* note 63 at ss 11–12.
[262] *Swedish Space Act 1*, *supra* note 57 at s 4 [translated by the author].
[263] *Finnish Space Act supra* note 74 at s 13; *French Space Act supra* note 64 at art 9; *Austrian Space Act*, *supra* note 61 at s 7.
[264] *Finnish Space Act supra* note 74 at s 13; *Austrian Space Act*, *supra* note 61 at s 7; *French Space Act supra* note 64 at art 9; *Swedish Space Act 1*, *supra* note 57 at s 4.

licence. Rather, a more logical conclusion is that the private actor cannot terminate its licence before it ceases to operate.[265]

Not all States limit the licensor's right to cancel a licence to a breach of conditions by the licensee. The UK licensing regime provides that:

> The regulator may revoke, vary or suspend a licence under this Act … with the consent of the licensee.[266]

While this wording puts the power to revoke a license exclusively in the hands of the regulator, it seems to allow the private actor to request the revocation. Similarly, under the US regime, the FCC has the right to revoke a communications licence if the licensee, among other things, breaches the licence conditions.[267] However, the FCC also allows the private operator to file an application to have the FCC revoke its licence.[268] In both the UK and US examples, however, it can be assumed that the licencing authority would be willing to revoke the licence only if the licenced activity has ended. It is, therefore, absurd to imagine that the licensor would authorize revocation of a licence before the activity has ended for the sole reason of enabling the licensee to avoid its space debris mitigation obligations.[269]

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[265] It is noted here that it must be possible for a private operator to revoke its licence once the activity has ended. However, once the space activity has ended, the obligation to dispose of the object would take effect. The focus was therefore on revoking a licence before the end of the activity.
[266] *UK Space Act supra* note 147 at s 15(3)(a).
[267] 47 USC *supra* note 116 at § 312a.
[268] See "Cancelling a License in the Universal Licensing System (ULS)" (14 October 2022) online: *Federal Communications Commission* <www.fcc.gov/wireless/support/knowledge-base/universal-licensing-system-uls-resources/cancelling-license>.
[269] Note that the discussion on mitigating space debris in chapter 4.5 is based on the end of an activity.

This takes us to the third question. Even if a private actor could terminate its licence or were to intentionally breach a condition of its licence to have it revoked, it is highly doubtful that this would terminate the licensee's obligation to mitigate space debris. In fact, some national laws provide expressly for the continuation of the licensee's obligation after the suspension of its licence. France's law, for example, provides that the authority that issued and revoked the licence may require the licensee to continue to take appropriate measures in accordance with the obligations set out in the revoked licence.[270] The licensing regime in Finland similarly provides:

> In its decision to amend or withdraw an authorisation, the Ministry may impose necessary conditions concerning the safe continuation or discontinuation of the space activities.[271]

The UK legislation likewise confirms that:

> The suspension, revocation or expiry of a licence does not affect the obligations of the licensee or former licensee under the conditions of the licence.[272]

The law in Austria includes a similar provision:[273]

> In the case of revocation of the license, the operator can be obligated to take measures for the continuation of or the safe ending of the space activity.[274]

However, in contrast to the regimes in the other States, the Austrian law goes on to provide:

> If the operator does not comply with these instructions, control of the space activity must be transferred to another operator by means of a decision from the Federal Minister for Transport, Innovation and Technology.[275]

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[270] *French Space Act supra* note 64 at art 9.
[271] *Finnish Space Act supra* note 74 at s 13.
[272] *UK Space Act supra* note 147 at s 15.
[273] *Austrian Space Act*, *supra* note 61 at s 7(3).
[274] *Ibid* at s 7(3).
[275] *Ibid.*

This additional provision is helpful because it explicitly addresses the risk that a space actor is unwilling to continue to perform its obligation to mitigate space debris or is unable to do so due to bankruptcy.[276]

5.3.2 The Hurdle of Acquiring a New Licence

Even if the termination of a private operator's licence is possible for the private actor (which, as observed, is highly unlikely), the operator would still need to be able to acquire a new, more favourable licence to avoid its original space debris mitigation obligations.[277] As two simple considerations demonstrate, acquiring a new licence is likewise not possible.

First, since the operator has not changed, the licensing laws of the original licensing State continue to apply; thus, the operators are still required to obtain a licence from that State.[278]

Second, even if the original licencing State did not require a licence to operate the object but only to launch it, as in Australia and Norway, the operator could still not obtain a licence in a second, unrelated State.[279] This assumes, logically, that the scope of application of the licensing regime in the second unrelated State precludes an actor who is not subject to that regime from acquiring a licence. This assumption, in turn, means a private actor would be able to obtain a

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[276] Note the references to this potential problem in the introduction, both for the oil industry and for Iridium.
[277] Note that the considerations in chapter 4, and to some extent in the previous section, showed that it is illegal to operate an object without a licence in some States. Therefore, if the operator continues to operate the object without a licence, he is breaking the law and could potentially be penalized.
[278] This would be similar to the consideration of flags of convenience discussed in chapter 4.
[279] This was noted in chapter 4.

licence in a second State only if it was already obliged to acquire that licence.[280] It can, therefore, be concluded that a private actor can neither terminate its licence nor acquire a new, more favourable, licence.

5.4 The Use of a Subsidiary Company to Avoid Licence Obligations

The previous two sections have shown how difficult, indeed impossible, it is for a private actor to escape its licence obligations by bringing about a cancellation of its existing licence and obtaining a new one with more favourable conditions in a second State. However, the answer to the research question is not that simple: what if the original licensee were to become a holding company for a new subsidiary operator in a more favourable State.[281] While this arguably would solve the obstacles addressed in the previous sections,[282] it would require the original licensee and operator to transfer control of the object to its subsidiary without the subsidiary having to obtain a licence from the original licencing State.[283]

The use of subsidiary companies to gain more favourable terms has been seen already. In the civil aviation market, there have been many mergers aimed at eliminating competition and obtaining more favourable airports from where to operate.[284] For example, Lufthansa bought

[280] This was noted in chapter 4.
[281] Holding companies are referred to as companies owning other companies across different jurisdictions. *Cambridge Dictionary* (2023) online: *Cambridge Dictionary* <dictionary.cambridge.org/dictionary/english/holding-company#> sub verbo "holding company."
[282] The transfer of control brings a natural end to the original licence, and the restrictions on acquiring a new licence are no longer an issue as the new operator would be in the "appropriate State."
[283] It should be noted that there does not necessarily have to be a new licence, the transfer of control can also be made to a State without any licensing requirements.
[284] See B Rajesh Kumar "Mergers and Acquisitions in the Airline Industry" in B Rajesh Kumar, *Mega Mergers and Acquisitions,* (London: Palgrave Macmillan, 2012) 226.

both Austrian Airlines and Swiss International Air Lines in 2008.[285] Since both Austrian and Swiss still operate independently, Lufthansa can now offer services that would otherwise have been impossible.[286] Similar acquisitions can be observed in the space sector, although it is unclear whether these were done to obtain more favourable regulatory conditions.[287]

However, in the space sector, a transfer of control to a subsidiary could still be regulated.[288] As mentioned above, most civil law States, with the exception of Norway and Sweden, regulate the transfer of control and not the transfer of the licence.[289] France, for example, stipulates that the transfer of control over a space object can only occur with the minister's consent.[290] Austria also regulates the transfer of control of an object.[291] It states that:

> A change in operator requires the authorisation from the Federal Minister for Transport, Innovation and Technology. The change of operator is to be approved under the conditions of § 4.[292]

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[285] See "Lufthansa Lands Austrian Airlines" *Forbes* (3 December 2008) online: <www.forbes.com/2008/12/03/lufthansa-austrian-airlines-markets-equity-cx_je_1203markets27.html?sh=5feffc74aeb6>; Kevin Done "Lufthansa pays €217m for Swiss takeover" *Financial Times* (25 March 2008) online: <www.ft.com/content/e1d4e966-fa89-11dc-aa46-000077b07658>.

[286] For example, booking a flight from Vienna to Zürich using Lufthansa is possible. "Flight options" (accessed 19 June 2023) online: *Lufthansa* <shop.lufthansa.com/booking/availability/0?portalCountry=CA>; Noting here that it usually is forbidden for an air carrier from one nation to fly between two foreign national airports. Paul Dempsey, *Public International Air Law* (2nd ed, Montreal: McGill University, 2017) 29–34.

[287] See for example SES's acquisition of Sirius in 2010, "Press Release" (23 April 2010) online (pdf): *SES* <www.ses.com/sites/default/files/2016-11/Q1-2010-e.pdf> at 2.

[288] Note here that the reasons for regulating the transfer of control in general can be found in the allocation of responsibilities under space law. This could form a separate thesis, but will not be further addressed in this work. Cordula Steinkogler noted the link between liability and transfer of control in Austrian legislation. Cordula Steinkogler "Austrian National Space Law" (2021) in Oxford Research Encyclopedias, Planetary Science, <oxfordre.com/planetaryscience/display/10.1093/acrefore/9780190647926.001.0001/acrefore-9780190647926-e-96;jsessionid=1981DF3243575C099C97446DBEBB287E?rskey=sCJCmD&result=3>.

[289] This was noted in the previous sections.

[290] *French Space Act supra* note 64 at art 3.

[291] *Austrian Space Act*, *supra* note 61 at s 8.

[292] *Ibid* at s 8.

Including the licensing conditions in the transfer of control to the subsidiary would mean that the subsidiary would be subject to the same space debris mitigation obligations as the original licensee.[293] However, Cordula Steinkogler observes that if control is transferred to an entity outside the scope of application of the Austrian Space Act, i.e., to an operator with a different home State,

> certain charges may be provided for in the authorisation process, including the exchange of information with the home state of the new operator as well as the clarification of obligations in the internal relationship.[294]

This potentially means that the original licence conditions would not necessarily obligate the subsidiary as the new owner of the object. The regime in Luxembourg also provides for a transfer of effective control with the approval of the competent minister.

> For the purposes of this article, "effective control" means the authority exercised over the activation of the means of command or remote control and, where applicable, the associated means of monitoring, necessary for the performance of the activities of launching, flight operation or guidance of one or more space objects.[295]

The law also provides that an agreement on the transfer of liability obligations between the two States is mandatory in the case of a cross-border transfer. A transfer of control is thus possible if the competent authority approves and the relevant agreements have been made.[296] However, it is highly doubtful that approval will be granted if the change of control is only in order to avoid the space debris mitigation obligations.

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[293] Note that section 4 contains the licence conditions. *Ibid* at s 4.
[294] Steinkogler *supra* note 288.
[295] *Luxembourg Space Act supra* note 74 at art 12(1) [translated by author].
[296] *Ibid* at art 12.

Moreover, such a transfer of control depends on the licensing regime in the State that granted the original licence. For example, US legislation prohibits such a transfer. As the US launch licence regime applies to a company incorporated under foreign law that if it is at least 51% owned by US citizens or a company incorporated under US law, meaning that the subsidiary would still have to obtain a US licence; in any event, this would have no impact on the obligation to prevent space debris since in the US these obligations are set out in the communications licence, not the launch licence.[297] The issues with the communications licence are discussed in the next chapter.

Also relevant here is the other type of legislation that would apply to such a transfer. Since space objects are considered dual-use goods, their export would fall under the International Traffic in Arms Regulations in the US.[298] The transfer of control of the object, if it can be considered an export, would therefore require the approval of the Department of State.[299] Similar export controls might also apply in other States. This again makes it clear that the availability of the subsidiary strategy to avoid space debris mitigation obligations depends on the law of the original licencing State and type of licence issued.

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[297] Chapter 4 noted the requirement for 51% of ownership for the US launch licence.
[298] See Jasper Helder et al "International Trade Aspects of Outer Space Activities" in *Outer Space Law: Legal Policy and Practice* (2017) 285.
[299] *Ibid.*

6. The Relevance of the International Telecommunications Union (ITU) to the Space Debris Mitigation Problem

6.1 Introduction to the ITU and Outer Space

Founded in 1865, the ITU is a significant regulator of the limited frequencies used to transmit signals.[300] While the ITU was originally founded to regulate the telegraph machine, its role changed due to problems with interference with radio signals and the monopoly of Marconi radio in the late 19th century.[301] Starting in 1906, the ITU created a frequency table at the Berlin Conference.[302] The allocation of frequencies in this table was expanded at later conferences, such as the Madrid Conference in 1932, the Atlantic City Conference in 1947 and the Geneva Conference in 1992.[303] These types of conferences were, in turn, turned into the Plenipotentiary Conferences and World Radiocommunication Conferences, resulting in regular updates of frequency allocation and related issues.[304] The ITU itself does not create laws but facilitates their adoption by member States through these conferences.[305] Therefore, this thesis should be understood as referring to the member States of the ITU when suggesting that the ITU is the appropriate body to facilitate unified international regulation.

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[300] See George A Codding Jr "Evolution of the ITU" (1991) 15:4 Telecommunications Policy 271, at 271.
[301] *Ibid*; Francis Lyall "The International Telecommunication Union: Origin and Role" (2021) in Oxford Research Encyclopedias, Communication, <doi.org/10.1093/acrefore/9780190228613.013.944>.
[302] *Ibid*.
[303] See Francis Lyall "Harmful Interference' and the ITU" in Mahulena Hofmann, ed, *Harmful Interference in Regulatory Perspective* (1 ed, London: Routledge, 2016) 19.
[304] See Audrey L Allison "The Basics of Satellites and the ITU" in Audrey L Allison, *The ITU and Managing Satellite Orbital and Spectrum Resources in the 21st Century* (Cham: Springer, 2014) 5.
[305] *Ibid*.

When Sputnik 1 caused interference with the transmission of signals in England, the US and the Netherlands, it became clear that the frequencies used for space activities had to be regulated.[306] Two years after Sputnik 1, the United Nations Ad Hoc Committee on the Peaceful Uses of Outer Space concluded that the ITU was the appropriate body to address the issue.[307] In the same year, the ITU allocated a band of frequencies for use in outer space.[308] These frequencies have since been expanded as space activities have increased.[309]

About 20 years later, the ITU expanded its work agenda to include regulation of the scarce orbital positions around Earth.[310] Starting with the regulation of orbital positions in GEO, the increase in LEO activity led to regulation being expanded to all orbits.[311] Today, it is somewhat common practice to assign not only the frequency used by the object in question but also the orbital position from which that frequency is used, both of which are registered in the ITU Master Register (MIFR).

The central rule for regulating the frequencies and the orbital positions provides that:

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306 See Kai-Uwe Schrogl "Die Strukturreform der ITU: Auswirkungen auf die Entwicklung der Weltraumnutzung und des Weltraumrechts" (1993) 42:2 Zeitschrift für Luft- und Weltraumrecht 182; Nandasiri Jasentuliyana "Regulatory Functions of I.T.U. in the Field of Space Telecommunications" (1968) 34 J Air L & Com 62, at 65.
307 Jasentuliyana *supra* note 306.
308 *Ibid*.
309 *Ibid*.
310 See Martin L Stern "Communication Satellites and the Geostationary Orbit: Reconciling Equitable Access with Efficient Use" (1982) 14:3 L & Pol'y Int Bus 859; Steven A Levy "Institutional Perspectives on the Allocation of Space Orbital Resources: The ITU, Common User Satellite Systems and Beyond" (1984) 16:2 Case W J Int L 171, at 175.
311 See Alice Rivière "The Rise of the LEO: Is There a Need to Create a Distinct Legal Regime for Constellations of Satellites?" in Annette Froehlich, ed, *Legal Aspects Around Satellite Constellations* (Cham: Springer, 2019) 39.

> In using frequency bands for radio services, Member States shall bear in mind that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries.[312]

Although all orbits are included, the focus of the orbital position assignment rules is on the regulation of GEO positions rather than those in LEO.[313]

The procedure for assigning these frequencies and orbital positions to States follows the same principles for both orbits, although the issues in the different orbits differ.[314] A State can apply to use an orbital position and frequency mainly on a first-come, first-served basis.[315] After the application is submitted, it is published and negotiated in accordance with the procedure in Article 9 of the Radio Regulations.[316] It is then included in the MIFR in the form of a filing to obtain priority for the frequency and orbital position in question.[317]

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[312] See *Constitution and Convention of the International Telecommunication Union*, 22 December 1992, 1825 UNTS 3, art 44, (entered into force 1 July 1994) [*ITU Constitution*].

[313] See Audrey L Allison "WRC-19: New space law enabling the sustainability of LEO" (2020) online (pdf): *Advanced Maui Optical and Space Surveillance Technologies Conference* <amostech.com/TechnicalPapers/2020/SSA-SDA/Allison.pdf>.

[314] See Audrey L Allison "ITU Regulatory Framework for Satellites" Audrey L Allison, *The ITU and Managing Satellite Orbital and Spectrum Resources in the 21st Century* (Cham: Springer, 2014) 17, at 17.

[315] *Ibid*.

[316] See *Radio Regulations of the International Telecommunication Union*, (Vol 1, edition 2020) art 9 [*Radio Regulations*]; "ITU Radio Regulatory Framework for Space Services" (accessed 29 June 2023) online (pdf): *International Telecommunications Union* <www.itu.int/en/ITU-R/space/snl/Documents/ITU-Space_reg.pdf>.

[317] Allison *supra* note 314.

The entire procedure, as well as the final filing in MIFR, is designed for a State and not for a private actor.[318] For a private actor to gain access to a frequency and orbital position, it can either apply to the State to use an existing filing or, and this the more likely alternative, have the State submit an application to the ITU for a specific orbital position and frequency.[319] In both cases, however, the filing does not belong to the private actor but to the State that filed it. It should also be noted that certain obligations are imposed on the State that registers a filing in the master register.[320]

Two conclusions can be drawn from this introduction. First, space is part of the ITU's regulatory mandate. It was clear from the beginning of the space age that there had to be specific regulations for spectrum use in space. Instead of entrusting UNOOSA with this task, it was considered more effective to expand the ITU's regulatory scope.[321] This expansion led to the regulation of orbital positions, which arguably can lead to the ITU also regulating space debris in the future.

Secondly, orbital positions and frequencies are essential for States. Filings are mainly on a first-come-first-served basis, orbital positions and frequencies are limited, and no space activity can occur without proper MIFR registration. Given this reality, it is clear that MIFR filings are

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[318] See Margaux Morssink "An Equitable and Efficient Use of Outer Space and Its Resources and the Role of the UN, the ITU and States Parties" in Annette Froehlich, ed, *Legal Aspects Around Satellite Constellations* (Cham: Springer, 2019) 1, at 4.
[319] *Ibid*.
[320] Note, for example, that the State has an obligation not to harmfully interfere with the frequencies of other States. This includes an obligation to regulate private operators in this respect. *ITU Constitution supra* note 312 at art 45.
[321] Note for example the statements made by the Ad Hoc Committee to this extent. Jasentuliyana, *supra* note 306.

important, even essential, to the State. Compared to the State, a private actor has more leeway when it comes to using a filing and may be able to use an existing filing. In addition, certain actors may request to use a foreign State's filings, applicable national laws permitting.[322]

6.2 The Transfer of MIFR Filings Internationally

Chapter 5 of the thesis has shown that, depending on the national law of the original licensing State, a company might be able to avoid its obligations under the licence to mitigate space debris by transferring control of the relevant space object to a subsidiary in another State. The reason a private actor would attempt to do this is to avoid the costs associated with the need to move the object out of its original orbit.[323] It is, therefore, necessary to examine whether an actor can use another State's MIFR filing. If not, the object must be removed from its original position. The cost of mitigation would then be equal to the cost of avoiding mitigation.[324] The impact of this question on the research question can be considered in two ways. First, can the filing be transferred between States? Secondly, can a private actor use a foreign State's filing if the filing is not transferable?

[322] Note here that the US regulation does not allow the use of frequencies by alien entities, as shown in chapter 4. Sweden, by comparison, has no such restriction in its domestic communications licence system. The link between the communications licence and the ITU regulatory framework is established in Article 18 of the Radio Regulations. *Radio Regulations supra* note 316 at art 18(1).
[323] As seen in the introduction.
[324] In both cases, fuel was used to move the object from its original position.

The answer to the first question is no: it is impossible to transfer a MIFR filing between States, except in the case of State succession.[325] For example, the filing for the above-mentioned Hong Kong satellites that were transferred from the UK to China after Hong Kong reverted back to China.[326] As discussed in the previous section, these filings are essential to the State for various reasons.[327] Therefore, not only is it impossible to transfer a State's filings to another State, but it is not advantageous for a State to do so. The State can either keep the filing for use by another private actor or abandon it altogether. Only in the second case could a different State follow the procedure to obtain that filing, which would take years and success would depend on competition from other States.

The answer to the second question is more complicated. In none of the cases of transfer of control considered in this thesis did the original orbital position continue to be used. A few months after the Marcopolo-1 satellite was sold, it was moved to the orbital position, 5º East, and later to 13º West, both Swedish positions.[328] Similar changes can be seen with the Marcopolo-2 satellite, which was moved to a Norwegian orbital position of 0.8º West after it was sold.[329] This

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[325] See Srinivasan Venkatasubramanian "Interaction between Registration of Space Objects and the Protection of Frequency Assignment" in Mahulena Hofmann & Andreas Loukakis, eds, *Ownership of Satellites:4th Luxembourg Workshop on Space and Satellite Communication Law* (Baden-Baden: Nomos Verlagsgesellschaft, 2017) 175, at 180.
[326] *Ibid* at 181.
[327] See Elina Morozova "Leasing of Orbital Positions" in Mahulena Hofmann & Andreas Loukakis, eds, *Ownership of Satellites:4th Luxembourg Workshop on Space and Satellite Communication Law* (Baden-Baden: Nomos Verlagsgesellschaft, 2017) 187, at 196, for both the responsibilities of States and the impossibility to transfer a filing between administrations (States).
[328] Magnusson *supra* note 203 at 1.
[329] See the entry for Marcopolo-2 in the UN index for the orbital position, *supra* note 207; ITU Query by publication references for multiple entries of Norway on that orbital position. "Query by publication references: SNL Part B - Query result" (27 June 2023) online: *International Telecommunications Union* <www.itu.int/net/ITU-R/space/snl/bresult/radvance.asp?q_sns_id=&sel_satname=all&ftexte=&sel_esname=none&ktexte=&sel_adm=all&sel_org=all&sel_ific=&sel_year=&sel_date_from=&sel_date_to=&sel_rcpt_from=&sel_rcpt_to=&sel_gso=gso&sel_gso=ngso&sel_orbit_from=-0.8&sel_orbit_to=-0.8&fenetre=ON>.

shows that it is theoretically impossible to continue to use the MIFR filing. However, it is difficult to argue that the change in position for both satellites was due to the transfer of control of the object as opposed to the change in its mission making the new position more favourable.

In contrast, there are many examples of a foreign actor using a State's filing:[330] Notable examples include Azerspace-1 (an Azerbaijani satellite using Malaysia's orbital position), Lybid-1 (a Ukrainian satellite operating from an Eutelsat position declared in France) and Belintersat-1 (a Belarusian satellite launched to a Chinese orbital position).[331] The use of these filings was authorized by an agreement between the (semi-)private operators; for example, Azerspace-1 involved an agreement between Azercosmos Joint Stock Exchange and MEASAT, and Lybid-1 involved an agreement between Ukrcosmos State Enterprises and Eutelsat.[332]

The example of ProtoStar-I, an object owned by "an Asian satellite services operator domiciled in Bermuda with U.S. operations based in San Francisco, California," is even clearer.[333] Under an agreement with Intersputnik, ProtoStar used the Belarusian filing for 98.5° E.[334] Shortly after launch, ProtoStar-I encountered several problems that eventually led to the termination of the agreement with Intersputnik and the company's subsequent bankruptcy.[335] This case illustrates

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330 Morozova *supra* note 327 at 198. Note here, for example, the limits set by the US in their telecommunications licence as discussed in chapter 4, arguing that these limits might also extend to the use of an American orbital position.
331 *Ibid* at 192–194.
332 *Ibid* at 193–194.
333 See Elina Morozova & Yaroslav Vasyanin "Dealing with Harmful Interference - the Protostar Case" in Mahulena Hofmann, ed, *Harmful Interference in Regulatory Perspective* (1 ed, London: Routledge, 2016) 41 at 43.
334 *Ibid.*
335 *Ibid.*

the possibility of using a foreign filing through an agreement not with the State that made the filing but with the private actor on whose behalf the filing was made.

Two arguments can be made of relevance to this thesis. First, a subsidiary operator could use the original filing through an agreement with the original holding company.[336] Since it is impossible to change the State of administration of the filing, it is assumed that only the underlying private actor has changed and not the filing State.[337] While the examples cited involved the use of a foreign filing immediately after launch, nothing in the current legal framework suggests that a transfer of control could not lead to the same result. However, given the costs and complexity of obtaining the authorizations and agreements required to transfer control, it could still be ineffective as a strategy to avoid mitigating space debris.[338]

Second, States may not allow or want a foreign operator to use their filings. In the case of ProtoStar-I, Belarus would have been held responsible for the satellite's signal interference problems.[339] As the State is ultimately responsible, it may wish to avoid the use of its filing by operators it cannot control. This is reflected, for example, in US law. While the legislation is not entirely clear, it implies that a US communications licence can be directly linked to its MIFR

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[336] Note that it was impossible to change the administrator of the filing. However, this is not what is claimed in the thesis. Rather, it considers a case where the operator changes, but the State administration remains the same.

[337] The Morozova supra note 327 at 196–197, mentioned issues on changes of administration would thus no longer be applicable.

[338] This notes the authorisations required for the transfer of control, under Chapter 5, as well as the negotiations on the continued use of the orbit with that State. There would be no immediate benefit to any party beyond the immediate negotiating gains.

[339] Morozova & Vasyanin *supra* note 333; Note that this could result in a State losing the protection against harmful interference for that filing, which could significantly affect a State.

filings.[340] Given the restrictions on foreign entities acquiring a US communications licence, it is doubtful that the FCC could or would authorize a transfer of the use of that filing by a foreign entity.[341] However, other countries, such as Sweden, have no such restrictions on alien usage, so there is still the possibility of using the ITU filings of other States abroad to achieve avoidance of space debris mitigation obligations.[342]

6.3 The ITU as the Solution to the Space Debris Problem

This thesis has argued that it may be possible for a licensee to avoid its mitigation of space debris obligations under the licence by transferring control of the object to a subsidiary in a more favourable State, albeit that this depends on the applicable national laws. As this possibility, even if remote, would undoubtedly be prejudicial to the long-term development of the space environment, a solution is needed.

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[340] Note that the procedures for obtaining a communication licence for a satellite are linked to the application for registration with the ITU. See Karl Kensinger "U.S. Small Satellite Licensing and the Federal Communications Commission" (7 November 2016) at 7 online (pdf): *International Telecommunications Union* <www.itu.int/en/ITU-R/space/workshops/2016-small-sat/Documents/Kensinger ITU Small Sat Symposium-110716.pdf>.

[341] Note here the limitations of the FCC licence as shown in chapter 4. Furthermore, it should be noted that a foreign entity could technically transmit signals to the US market via US ground stations. However, the wording used is a space object without a US licence, suggesting that the signals used are foreign. See 47 USC, supra note 116, at §25.137; see also "Comprehensive Review of Licensing and Operating Rules for Satellite Services" (18 August 2018) online: *Federal Register* <www.federalregister.gov/documents/2016/08/18/2016-14800/comprehensive-review-of-licensing-and-operating-rules-for-satellite-services>.

[342] Note here the lack of such limits on the Swedish communication licence. *Swedish Communication Law supra* note 88.

More generally, many believe that the current framework, based on overlapping and non-uniform national laws, is insufficient to address the containment of space debris.[343] This has led to a discussion on which international body would be best suited to achieve consensus on a unified solution. Some consider the International Civil Aviation Organisation (ICAO) the best choice for parts of these activities, as there is no limitation between Earth and space.[344] Others argue that ICAO has no jurisdiction over space and propose an entirely new body similar to ICAO dedicated to space.[345] Gilles Doucet, for example, argues that the differences between national space debris mitigation regimes and other space-related aspects would be most effectively addressed through the adoption of Standards and Recommended Practices (SARPs).[346] However, since ICAO has no direct jurisdiction, a body must be created to adopt these SARPs: an ICAO for Outer Space.[347] While this proposal is logical, the time, effort and cost of creating an entirely new body to address the space debris problem makes it unrealistic. For this reason, it is suggested, in this thesis, that the ITU, an already existing body, is the more effective choice.

In response to that proposal, some might argue that ITU is not a suitable body. While it has some regulatory authority over space activities, it is limited to regulating frequencies and orbital positions. Article VI of the Outer Space Treaty and the licences associated with that article, as

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[343] See Lucien Rapp & Maria Topka "Small Satellite Constellations, Infrastructure Shift and Space Market Regulation" in Annette Froehlich, ed, *Legal Aspects Around Satellite Constellations* (vol 2, Cham: Springer, 2021) 1, at 3.
[344] For example Paul Fitzgerald "Inner Space: ICAO's New Frontier" (2014) 79:1 J Air L & Com 3, for the use of ICAO to regulate suborbital flights; Ruwantissa Abeyratne "ICAO's Involvement in Outer Space Affairs - A Need for Closer Scrutiny" (2004) 30:2 J Space L 185, for a general discussion.
[345] For example, Ram Jakhu, Tommaso Sgobba & Paul Stephen Dempsey for example have written a book titled *The Need for an Integrated Regulatory Regime for Aviation and Space: ICAO for Space?* (Vienna: Springer, 2011).
[346] See Gilles Doucet "Outer space SARPs: A mechanism for implementation of space safety standards" (2019) 6:2 J Space Safety Engineering 145.
[347] *Ibid.*

well as the general problem of mitigating space debris, are, on the face of it, outside ITU's competence. Rather, UNOOSA or UNCOPUOS are the more appropriate UN bodies to deal with these issues, given their existing resolutions on related issues.[348] This leads to two questions: Why the ITU and would UNOOSA accept this solution?

The answer to the first question is simple: the ITU is a highly efficient regulatory body that has been able to fulfil its mandate even in today's difficult geopolitical climate.[349] In contrast, no legally binding international space-specific treaties have been adopted since 1984.[350] While some States have tried to agree on new international regulations, especially on space mining, they have had limited success.[351] Similarly, UNOOSA has only succeeded in achieving agreement on non-legally binding soft law resolutions or guidelines on some of the more important issues in the space sector.[352] In contrast, the ITU has been able to reach a groundbreaking consensus on matters such as military frequency regulation.[353] This ability to efficiently solve a problem

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[348] Note that UNOOSA has adopted several resolutions trying to clarify the space treaties. “Space Law: Resolutions” (accessed 29 June 2023) online: *United Nations Office for Outer Space Affairs* <www.unoosa.org/oosa/en/ourwork/spacelaw/resolutions.html>.
[349] Schrogl *supra* note 306 at 182.
[350] Notes that the Moon Agreement was the last binding treaty, which itself has only 18 ratifications. Committee on the Peaceful Uses of Outer Space *supra* note 198.
[351] Note here, for example, the political issues surrounding the Artemis Accords. Rossana Deplano, “The Artemis Accords: Evolution or Revolution in International Space Law?“ (2021) 70:3 The Int and comparative L quarterly 799.
[352] Note that not only has there been limited success in reaching a binding agreement on space debris, but also that the interpretation of Article VI and the lack of registration have only been resolved to a limited extent.
[353] For example, it managed to agree on a breakthrough on the regulation of military frequencies at the last Plenipotentiary Conference. “Highlights: ITU Plenipotentiary Conference 2022: 11 October” (2022) online: *International Telecommunications Union Plenipotentiary Conference Bucharest 2022* <pp22.itu.int/en/newsroom/highlights/#oct14>.

through facilitating international consensus is also needed to solve the space debris issue, where the soft law guidelines provide a promising starting basis for achieving consensus.[354]

So, the question is rather whether the UN sister organizations would accept the ITU as the appropriate consensus seeking venue. This can be divided into two sub-questions. If the ITU's work mandate is expanded to address the mitigation of space debris, this produces a direct conflict with UNOOSA's mandate. The first sub-question, therefore, is whether UNOOSA would accept ITU assuming jurisdiction. Two considerations favour UNOOSA's willingness to do so. First, UNOOSA has already accepted the work of other multilateral institutions that have tried to solve the space debris problem, notably, the IADC or the ITU. Even though these Guidelines are not legally binding, there is no reason why UNOOSA would automatically reject a consensus solution achieved through ITU.

Second, UNOOSA has accepted ITU's jurisdiction over the regulation of certain licences. While this thesis has generally assumed for the sake of simplicity that all licences are linked to Article VI of the Outer Space Treaty, communications licences can be linked to the ITU's Radio Regulations. Article 18 of the Radio Regulations provides:

> No transmitting station may be established or operated by a private person or by any enterprise without a licence issued in an appropriate form and in conformity with the provisions of these Regulations by or on behalf of the government of the country to which the station in question is subject.[355]

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[354] Note that anything in the Plenipotentiary Conferences is usually passed by consensus. Allison *supra* note 304. Further note the extensive membership of the IADC, including the US, Russia and China, as noted in chapter 4.

[355] *Radio Regulations* supra note 316 at art 18(1).

The fact that these communications licences can include requirements for space debris mitigation is illustrated by the US communications licencing regime. It is, therefore, arguable that UNOOSA would have no problem if the ITU were to add a space debris mitigation obligation to the licence requirements in Article 18 of the Radio Regulations. This, in turn, would reduce or eliminate the lack of uniformity in the existing national mitigation requirements of different States.

This leads to the second sub-question: Would the ITU be willing to assume responsibility for regulating space debris mitigation? Some scholars have already argued that the ITU is the appropriate body to solve the space debris problem.[356] Furthermore, the ITU itself has already issued recommendations for the containment of space debris in GEO.[357] Admittedly, the removal of a defunct space object from orbit is not a direct part of the ITU's existing mandate. That said, if one considers space debris mitigation as advancing the sustainable use of an orbital position rather than the movement of an object, it can be argued that it should be included in the ITU’s mandate. While more than one satellite can fit in an orbital position, it is only logical that orbital positions will eventually become full if defunct objects are not removed. As the ITU's jurisdiction has been extended to orbital positions due to the scarcity of positions in certain orbits, it is only natural to extend its jurisdiction again to facilitate sustainable use of these positions by States.[358]

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[356] See the literature review.
[357] As noted in chapter 4 on space debris mitigation requirements.
[358] See the previous section on this topic.

At the ITU's 2022 Plenipotentiary Conference, member States adopted Resolution 219.[359] That Resolution mandated the Conference to instruct the Radiocommunication Assembly, "as a matter of urgency," to conduct a study on the long-term sustainability of "the issue of the increasing use of radio-frequency spectrum and associated orbit resources in non-GSO orbits."[360] Sustainable development, which is arguably the objective of the mandated study, is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[361] The mitigation of space debris, as already suggested above, falls within this concept.

That said, ITU member States have not yet supported the inclusion of space debris in the ITU's mandate. The minutes of the 2022 Plenipotentiary Conference report that the representatives of Brazil and Samoa commented on the adoption of resolution COM5/4 which has the same title as Resolution 219 on sustainability.[362] Their interventions explicitly stated that space debris concerns generally fall outside the scope of ITU's work:

> Other concerns that fell outside the scope of ITU's work, such as the environmental and economic impact, visual pollution, safety in space, exponential debris growth and collision risks, needed to be addressed in the appropriate forums.[363]

The same point was also made by the ITU's Head of Space Services.[364] It is puzzling why they came to this conclusion, especially in light of the ITU's previous space debris mitigation

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[359] See *Sustainability of the radio-frequency spectrum and associated satellite-orbit resources used by space services* (Bucharest, 2022) ITU Resolution 219.
[360] Ibid at s 1; Also note that GSO, like GEO, stands for Geostationary orbit.
[361] See "Sustainable Development" (accessed 27 July 2023) online: *International Institute for Sustainable Development* <www.iisd.org/mission-and-goals/sustainable-development>.
[362] *Supra* note 50 at 4.
[363] *Ibid*.
[364] See "ITU and space: Ensuring interference-free satellite orbits in LEO and beyond" *International Telecommunications Union* (9 February 2022) online: <www.itu.int/hub/2022/02/itu-space-interference-free-satellite-orbits-leo/>.

recommendations. Nonetheless, it calls into question the realistic prospects of the ITU, despite its past success at achieving consensus, becoming the venue to facilitate a unified solution to the space debris problem,[365] at least pending the results of the Radiocommunication Assembly study.

7. Conclusion

In recent decades, the number of private operators in the space industry has increased significantly. With the expansion of private space activities, the ever-growing problem of space debris has become of increasing concern. Due to the current structure of international space law, it is primarily up to States to regulate the problem at the national level and require the private operators for which they are responsible to mitigate space debris. However, these efforts by States are far from uniform, resulting in both overlaps and gaps in the applicable rules. This led to the principal research question addressed by this thesis: Can a private actor avoid costly space debris mitigation obligations by changing its original licensing regime to a less burdensome one?

To answer that question, chapter 4 set out the background to the regulation of space debris under national law. First, the rationale for why States regulate private actors through legislation, including licensing systems, was examined. Here it was argued that the adoption of national laws cannot always be linked to the emergence of private space activity in an enacting State. Instead, they are linked to Article VI of the Outer Space Treaty under which States bear the international responsibility for "national activities" in outer space with the "appropriate State" obligated to establish a regulatory framework that requires authorization and continuing supervision of the

[365] ITU Space Debris Mitigation Guidelines *supra* note 152.

activities of non-governmental private space actors. Based on an analysis of representative national laws, it was shown that the scope of "national activities," i.e., what activity is regulated and must be licensed, in practice ranges from the launch of space objects to both launches and the operation of the launched object in space. With respect to the understanding by States of the meaning of "appropriate State," it was shown that while all the national regimes examined required an operator to obtain a licence for activities within the "territorial jurisdiction" of the enacting State they differ when it came to the scope of "personal jurisdiction" exercised over the extraterritorial activities of their nationals. The relationship between the registration of an object under Article VIII of the Outer Space Treaty and national licencing regimes adopted pursuant to Article VI was considered next. Here it was demonstrated that while the registering State and the licencing State superficially appear to be, and in most cases are, the same, there is no link between the licence and the registration. Chapter 4 concluded by examining the regulation of space debris under representative national laws and licencing regimes. It was shown that while different States take different approaches, there is also a degree of consensus.

Chapter 5 considered the potential for abuse of the national regimes reviewed in chapter 4. It was shown that it would be impossible for a private actor to escape the space debris obligations attached to its original licence by terminating the licence and acquiring a new licence in a State with a less onerous licensing regime. On the other hand, it was suggested that the original licensee might be able to indirectly effectuate this strategy by establishing a foreign subsidiary and transferring control of the relevant object to that subsidiary, depending on the scope of the applicable national laws.

After providing an overview of the ITU and the ITU regulation on frequencies and orbital positions, chapter 6 considered the continued use of the original licensee's frequency and orbital position under the relevant State's MIFR filing by a foreign subsidiary to whom control of a space object is transferred pursuant to the strategy discussed in chapter 5. Here it was determined that although the original operator's filing cannot be transferred, its foreign subsidiary could continue to use it through an agreement with the original operator. That said, it was again emphasized that this depended on the national law of the original licencing State since some regimes, e.g., the US communications licencing regime, prevents the use of a filing by a foreign operator.

Considering that the diverse national regimes do not necessarily prevent licensees from indirectly escaping the space debris mitigation obligations attached to the original licence, and considering the gaps and overlaps in the existing non-uniform national regimes, chapter 6 concluded by exploring the advantages of expanding the ITU's work mandate to include the facilitation of consensus on an internationally binding unified regime to address space debris mitigation. While ITU member states have not demonstrated any support for the addition of that responsibility, this may change when the Radiocommunication Assembly completes its study of the long-term sustainability of the increasing use of radio-frequency spectrum and associated orbit resources mandated by the ITU's 2022 Plenipotentiary Conference.

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