

NEWSPACE, OLD PROBLEMS: ASSET-BASED SATELLITE FINANCING IN THE ASIA-PACIFIC

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Can a lender take a security interest over an orbiting satellite? This article addresses this question under the laws of Australia, the Hong Kong Special Administrative Region of the People’s Republic of China, and Singapore. The results of this comparative inquiry highlight the legal challenges that reduce the attractiveness of satellite security interests and, as a corollary, the prospects for asset-based satellite financing. More generally, this inquiry indicates the need for space-focused law reform across the region, given the technical and commercial changes underway in the current ‘NewSpace’ era.

I. INTRODUCTION

Lenders have not traditionally viewed an orbiting satellite as adequate security for a loan. Instead, lenders prize security over a satellite’s customer contracts. The result is that, as Goode notes, satellite financing is “regarded as more in the nature of *project finance* than *asset-based finance*.”¹ This reliance on project finance has not previously been viewed as problematic. But the satellite industry’s commercial structure is rapidly changing. New entrants with big ideas—but relatively empty pockets—characterise the current ‘NewSpace’ era.² In this context, a project finance structure has three key disadvantages. First, start-ups may find it challenging to secure

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¹ Roy Goode, *Official Commentary on the Convention on International Interests in Mobile Equipment and Protocol Thereto on Matters Specific to Space Assets* (Rome: International Institute for the Unification of Private Law (“UNIDROIT”), 2013) at 158 [emphasis added] [Goode, *Official Commentary on Space Assets Protocol*]. Beale *et al* further explain that “the decision to lend on the basis of asset-based financing is made largely by assessing the assets available as security, rather than an assessment of the future cash flow of the business.” See HG Beale *et al*, *The Law of Security and Title-Based Financing*, 3d ed (United Kingdom: Oxford University Press, 2018) at 22 [Beale, *Law of Security*]. Conversely, project finance is “a structure used to finance infrastructure projects. . . whereby the lenders are paid out of the income generated by the project.” See Beale, *Law of Security* at 27.

² This era is characterised by the rapid commercialisation of space activities, such that private entities (rather than national space agencies) are increasingly predominant in space.

customer contracts of sufficient durability.³ Second, project financing's inherent lender control may conflict with start-ups' desire to pivot rapidly.⁴ Third, the complexity of project finance structures leads to high transaction costs (and spending hard-won funds on lawyers' and bankers' fees is anathema to start-ups).

In comparison to project finance, asset-based financing is much simpler (and cheaper). Rather than relying on revenue streams, the asset-based lender looks to hard assets for security. This finance structure has "long been an invaluable tool to finance small or risky businesses, particularly in the first, difficult stages."⁵ It is also a standard structure in ship and aircraft finance. But it is rarely used in satellite finance: a lender who will accept a satellite as its core security is the exception rather than the norm.

The unique operational factors that affect space activities can justify this reluctance. More specifically, the location of a satellite in outer space means that it is not repairable, not reconfigurable and essentially a disposable asset. Such an asset is illiquid, as it is not readily remarketable following borrower default or insolvency.⁶ Nor can it be practicably repossessed. The result is that a lender may well view a satellite security interest as an 'illusory' security that is out of sight, out of reach and, ultimately, out of mind.

My argument is that recent technical developments will change this assessment. Satellites are becoming increasingly flexible in their operations, and on-orbit refuelling is now a possibility.⁷ The capability to capture and return a satellite to Earth is returning.⁸ In time, these developments will lead to satellites having residual value. As a result, a livelier secondary market for orbital assets can be expected—as can increased demand from NewSpace companies for asset-based satellite financing.

This is particularly true for the Asia-Pacific. Space is notoriously capital intensive, yet the regional industry comprises many small, relatively new and thinly capitalised companies.⁹ These companies usually lack access to the public funding sources that are available to established operators. For non-dilutive funding, they are forced to

³ Nesgos explains that "[i]n order to constitute meaningful security for lenders," these contracts "should be long-term (five to ten years) and not be subject to termination except for failure. . . to meet performance specifications": Peter D Nesgos, "Recent Developments in Commercial Space Law" (1997) 22 *Annals Air & Space L* 433 at 437, 438 [Nesgos, "Commercial Space Law"].

⁴ This control arises through the covenants and restrictions set out in the project documents. See: Irene Low, "Obtaining Finance" in Beena Sorab, ed. *Developing and Financing Telecommunication Satellite Projects in Asia* (Hong Kong: Asia Law & Practice, 1997) 125 at 135.

⁵ George V D' Angelo, *Aerospace Business Law* (Westport, US: Quorum Books, 1994) at 105 [D' Angelo, *Aerospace Business Law*].

⁶ While some secondary markets transactions have occurred, they remain relatively rare. See generally Mark J Sundahl, *The Cape Town Convention: Its Application to Space Assets and Relation to the Law of Outer Space* (Leiden: Martinus Nijhoff Publishers, 2013) at 4 [Sundahl, *Cape Town Convention Application*].

⁷ See generally Joseph N Pelton, "On-Orbit Servicing and Retrofitting" in Joseph N Pelton, Scott Madry & Sergio Camacho-Lara, eds. *Handbook of Satellite Applications* (New York, NY: Springer, 2017) 1237 at 1249 [Pelton, Madry & Camacho-Lara, *Handbook of Satellite Applications*].

⁸ Satellites—notably Indonesia's Palapa B2 satellite—have previously been retrieved from low Earth orbit by the Space Shuttle. See: Sundahl, *Cape Town Convention Application*, *supra* note 6 at 84. However, the end of the Space Shuttle program means that there is no operational vehicle that can retrieve a satellite from any orbit. SpaceX's forthcoming 'Starship' system is intended to have this capability.

⁹ See generally European Space Policy Institute, ed. *New Space in Asia* (Vienna: European Space Policy Institute, 2021).

look to private credit. “The ability to give security”, Akseli notes, “influences both the cost of credit and the availability of credit.”¹⁰ Accordingly, securing financing using the limited assets these companies do have—namely, orbiting satellites—is a particularly efficient way to bridge financing gaps¹¹ in the Asia-Pacific. In some jurisdictions, it may be the only way.¹²

The viability of asset-based satellite financing does not depend solely on commercial and technical factors. A lender must also consider legal factors. In particular: can a lender take a security interest over an orbiting satellite? In Part II of this article, I respond to this question by identifying and developing two critical characteristics of satellites that affect their legal treatment. The first characteristic—which I call the ‘locational characteristic’—is simply that satellites operate in outer space. This characteristic means that they are physically distant from Earth. But they are also *legally* distant. By this, I mean that satellites operate in an area beyond territorial sovereignty, far from Earth-based jurisdictions and their courts.

The second critical characteristic is that satellites are subject to a complex, dual international-national regulatory regime.¹³ A consequence of this ‘regulatory characteristic’ is that various licences are required to operate a satellite, and international coordination is needed with respect to radio spectrum and orbital slot¹⁴ utilisation. These licences are non-assignable, and, as a matter of international law, there is no property in spectrum or an orbital slot. Yet, without these licences and a cleared spectrum and slot, the satellite cannot be operated profitably (if at all).

Having established the locational and regulatory characteristics of satellites, Part III of this article then explores how these characteristics impact the attachment, perfection, and enforcement of satellite security interests. The comparative jurisdictions for this analysis are three of Asia-Pacific’s leading jurisdictions for asset-based financing: Australia,¹⁵ the Hong Kong Special Administration Region of the People’s Republic of China (“Hong Kong”), and Singapore. Reference is also made to the *Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets* (“Space Protocol”) and to the *Cape Town Convention on International Interests in Mobile Equipment* (“Cape Town Convention”).¹⁶

¹⁰ N Orkun Akseli, “Secured Transactions Law Reform in Asia and Access to Finance: What can the UNCITRAL Model Law on Secured Transactions Offer?” in Louise Gullifer & Dora Neo, eds. *Secured Transactions Law in Asia: Principles, Perspectives and Reform* (Oxford, UK: Hart Publishing, 2021) 69 at 69 [Gullifer & Neo, *Secured Transactions*].

¹¹ Bruce B Cahan, Irmgard Marboe & Henning Roedel, “Outer Frontiers of Banking: Financing Space Explorers and Safeguarding Terrestrial Finance” (2016) 4:4 *New Space* 253 at 11.

¹² Dara A Panahy & R Mittal, “The Prospective UNIDROIT Convention on International Interests in Mobile Equipment as Applied to Space Property” (1999) 4:2 *Uniform L Rev* 303 at 305.

¹³ D’Angelo, *Aerospace Business Law*, *supra* note 5 at 11.

¹⁴ Essentially, a pathway through outer space around the Earth.

¹⁵ While Australia is a federation, this article refers generally to “Australia” as a jurisdiction, and “Australian law” to signify the laws in force at the federal (that is, Commonwealth) level. This is justified on the grounds that the *Personal Property Securities Act* is a Commonwealth statute. See Anthony Duggan & David Brown, *Australian Personal Property Securities Law*, 2d ed (Australia: LexisNexis Butterworths, 2016) at 23 [Duggan & Brown, *Personal Property*].

¹⁶ *Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets*, Berlin, 9 March 2012 [*Space Protocol*]; *Convention on International Interests in Mobile Equipment, Cape Town*, 16 November 2001, 2307 UNTS 285 (entered into force 1 March 2006) ratified by 77 states and the EU [*Cape Town Convention*]. See generally Sanam Saidova, *Security Interests*

The *Space Protocol* provides a uniform regime for the creation, perfection, priority and enforcement of international security interests in “space assets” (including satellites). While not currently in force, the *Space Protocol* serves as a further point of comparison that is external to the comparative jurisdictions. The aim of this analysis is twofold. First, to illustrate how the two critical characteristics challenge existing secured transactions legal regimes across the comparative jurisdictions. Second, to indicate possible reforms in light of the *Space Protocol*. More broadly, I aim to show how lawmakers will need to think laterally about what commercial parties will ask of, and expect from, legal systems in the NewSpace era. This broader theme is advanced, by way of conclusion, in Part IV.

Some caveats: the complexity of the various agreements, participants, and legal issues involved in satellite finance transactions means that this article cannot provide a complete treatment of this subject. In particular, I will not address the financial licensing required of any party to a satellite finance transaction. Nor will I elaborate on the intricacies of space-related contracts or taxation. In addition, issues regarding priority, insurance, exports, and conflict of laws are only briefly addressed in Part III. Finally, this article does not focus on the comparative jurisdictions’ secured transactions laws, which are analysed and critiqued elsewhere.¹⁷ These exclusions do not detract from this article’s core argument that it is an opportune time for the comparative jurisdictions to address the numerous legal challenges in taking security interests over satellites. By doing so, they will give themselves the edge in an industry that has unrealised and growing potential.

II. SATELLITE INDUSTRY AND ASSETS

The history of Asia-Pacific satellites begins in 1967, with the launch of a satellite from Australia.¹⁸ The first Japanese and Chinese satellites launched three years later,¹⁹ followed by an Indian satellite in 1975.²⁰ But all these satellites were technology demonstrators. The region’s first commercial satellite was an Indonesian telecommunications satellite, Palapa A1, launched in 1976.²¹ By 2000, Hong Kong’s

under the Cape Town Convention on International Interests in Mobile Equipment (Oxford: Bloomsbury Publishing, 2018) [Saidova, *Security Interests*].

¹⁷ See generally: for Australia, Duggan & Brown, *Personal Property*, *supra* note 15; for Hong Kong, Mark Williams, Haitian Lu & Chin Aun Ong, *Secured Finance Law in China and Hong Kong* (Cambridge: Cambridge University Press, 2010) [Williams, Lu & Ong, *Secured Finance Law*]; and for Singapore, Dora Neo, “Secured Transactions Law in Singapore: Living with Untidiness” in Gullifer & Neo, *Secured Transactions* 397, *supra* note 10 [Neo, “Secured Transactions Law in Singapore”].

¹⁸ Australian Government Department of Defence, *50th Anniversary of Australia’s First Satellite*, online: Defense Science and Technology Group <<https://www.dst.defence.gov.au/news/2017/11/08/50th-anniversary-australias-first-satellite>>.

¹⁹ See National Aeronautics and Space Administration, *Ohsumi*, online: NASA Space Science Data Coordinated Archive <<https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=1970-011A>>; and *PRC I*, online: NASA Space Science Data Coordinated Archive <<https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=1970-034A>>.

²⁰ Government of India, Department of Space, Indian Space Research Organisation, *Aryabhata*, online: Department of Space, Indian Space Research Organisation <<https://www.isro.gov.in/Spacecraft/aryabhata-1>>.

²¹ The Jakarta Post, *A Brief History of Telkom Satellites From Palapa A1 to Telkom 3S*, online: The Jakarta Post <<https://www.thejakartapost.com/longforms/longform-telkom/>>.

primary satellite operators—Asia Satellite Telecommunications Company Limited and APT Satellite Company Limited—had deployed satellite fleets;²² Singapore’s first commercial satellite was in operation;²³ and the regional industry association²⁴ had been established.

A variety of financing structures funded this growth. Nesgos summarises the history of satellite financing as follows:

[o]riginally, financial resources for manufacturing and launching satellites were secured based on the strong corporate or sovereign credit of sponsors. The early 1980s witnessed a proliferation of tax-motivated leasing of satellites. . . until tax benefits were eventually eroded. The emergence of commercial regional satellite operators brought with it project financing-type techniques, whereby the strength of expected cash-flows. . . provided the support for the financing of satellite and launch service costs.²⁵

The *Space Protocol*, which is described more fully in Part III of this article, was negotiated in this context. Its provisions aim to facilitate both project- and asset-based financing structures. However, the *Space Protocol* does not rely solely on the concept of a ‘satellite’. Rather, the *Space Protocol* uses the broader concept of ‘space assets’, which is relevantly defined as ‘any man-made uniquely identifiable asset in space or designed to be launched into space’.²⁶ This broad concept reflects the diverse assets that future commercial space enterprises may utilise. Nonetheless, this article focuses on telecommunications satellites as they are the most commercially mature segment within the broader space industry.²⁷ For the benefit of readers who are not industry specialists, the following paragraphs provide a brief overview of the tangible and intangible assets in a typical commercial telecommunications satellite system. I then elaborate on the locational and regulatory characteristics.

A. Tangible Assets

Custom divides a satellite operator’s tangible assets²⁸ into the space, ground, and user segments. One or more satellites constitute a system’s space segment. A typical

²² AsiaSat, *About Us—Milestones*, online: AsiaSat <<https://www.asiasat.com/aboutus/30years/milestone>>; Apstar, *Company Profile*, online: Apstar <<https://www.apstar.com/en/about-apstar/>>.

²³ ST-1, a joint venture between Singapore Telecommunications Limited (better known as ‘Singtel’) and Chunghwa Telecom Company Limited. See Singapore Infopedia, *Singapore’s First Satellite*, online: Singapore Infopedia <https://eresources.nlb.gov.sg/infopedia/articles/SIP_1866_2012-01-27.html>.

²⁴ The Asia-Pacific Satellite Communications Council (“APSCC”), *About*, online: APSCC <<https://apsc.or.kr/about/>>.

²⁵ Peter D Nesgos, “New Developments in Space Law Concerning Financing and Risk Management” (2002) 27 *Annals Air & Space L* 477 at 477, 478.

²⁶ *Space Protocol*, *supra* note 16, art I(2)(k).

²⁷ The satellite industry comprised 74% of the global space industry in 2019. Satellite Industry Association, *State of the Satellite Industry Report June 2020*, online: Bryce Space and Technology <<https://bryce.tech.com/reports>>.

²⁸ That is, property that can be physically perceived and possessed.

satellite comprises a bus²⁹ and a payload. Payloads vary. The primary commercial applications are telecommunications or remote sensing of Earth. For the former, the payload will be transponders.³⁰ For the latter, the payload will be sensors and imaging devices.

The ground segment includes ground stations and associated equipment. Satellite dishes are the most readily recognisable component of the ground segment. Telemetry, tracking and control (“TT&C”) installations are an essential part of a satellite system: as D’Angelo summarises, these installations “perform the housekeeping functions for the satellite.”³¹ Jurisdiction and operation of the TT&C installation are also legally relevant, as they can impact the perfection (and by extension) priority of a satellite security interest.³²

The user segment is a broad category that comprises the terminals, antennas, decoders, handsets and other equipment used by satellite customers. While a lender may take security over the user segment, such security is unlikely to be problematic. This is because the user segment is not affected by the locational characteristic. And it is only lightly affected (if at all) by the regulatory characteristic.³³ For the same reasons, taking security over the ground segment is relatively straightforward. By contrast, the space segment is affected by both characteristics, thereby generating significant complexity for lenders (and their lawyers).

B. Intangible Assets

A satellite system involves a wide variety of intangible assets. These assets include satellite procurement and launch services agreements, as well as customer agreements. Shares and intellectual property also fall within this category, as do the insurance policies that cover a satellite’s pre-launch, launch and in-orbit phases.

For two reasons, insurance policies are of primary concern to lenders. First, the harsh environment of outer space means that even minor damage to, or defects in, a satellite can cause the loss of the entire asset. And if this occurs, the only significant asset available to repay the lender is likely to be insurance proceeds. Second, the physical inaccessibility of a satellite complicates investigations into, and

²⁹ The term ‘bus’ broadly refers to the support structure for a payload, together with other infrastructure elements such as batteries, solar arrays and momentum wheels. See: Tarik Kaya & Joseph N Pelton, “Overview of the Spacecraft Bus” in Pelton, Madry & Camacho-Lara, *Handbook of Satellite Applications*, *supra* note 7 at 1300.

³⁰ Goode, *Official Commentary on Space Assets Protocol*, *supra* note 1 at 169 (defining a transponder as “that part of the payload which receives signals from an uplinking ground station, amplifies them, converts them to a different frequency. . . and transmits them to one or more other ground receiving stations”).

³¹ D’Angelo, *Aerospace Business Law*, *supra* note 5 at 70.

³² This issue is further described in Part III of this article.

³³ Some jurisdictions require licensing of user segment components. For example, a satellite phone requires approval in India. See Government of India, Ministry of Communications, *Restrictions on the use of Satellite Phone*, online: Government of India, Ministry of Communications <<https://dot.gov.in/restrictions-use-satellite-phone>>. Export controls may also apply to some user segment components.

disputes regarding, the cause of any damage.³⁴ A ‘watertight’ insurance policy—that is, one with minimal exclusions—will sidestep this issue. These are, of course, consequences of the locational characteristic. But perhaps the most important intangible asset class is the various licences³⁵ required to operate the space and ground segments, utilise spectrum and occupy an orbital slot. These licences are a consequence of the regulatory characteristic. I elaborate on both characteristics in the following section.

C. Locational and Regulatory Characteristics

Fletcher notes that “[o]ne of the key variables in the legal analysis of a project, and certainly the one that can neither be structured around nor wished away, is its location.”³⁶ This is especially true of space, and this locational characteristic has two distinct impacts on satellite security interests.

First, at the operational level and following an event of default, “[p]hysical repossession [of a satellite] is likely to be impracticable; in the ordinary way the only type of action capable of affecting the availability of the space asset. . . [is] constructive repossession in the shape of the assumption of control through such measures as the taking over of command codes.”³⁷ Taking control of the TT&C installation—which would house the satellite’s command codes—would also have the same effect.

The second impact is that an orbiting satellite is not within any State; more specifically, such a satellite is not within any territorial sovereignty. This is because the *Outer Space Treaty*³⁸ (“OST”) provides that outer space “is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.”³⁹ The impact of this is that there is no territorial sovereignty anywhere in outer space.⁴⁰ Of course, other assets—such as ships and aircraft—also venture beyond territorial sovereignty.⁴¹ However, these assets invariably return to territorial sovereignty. A satellite will not re-enter territorial sovereignty in

³⁴ Henry Wong, “Commercial Satellite Project Financing: Leveraging Non-Traditional Forms of Insurance to Manage Risk” (1998) 4:2 J Project Finance 39 at 42.

³⁵ The *Space Protocol* aptly illustrates the broad range of permissions that space activities can require. See *Space Protocol*, *supra* note 16, art 1(2)(e) (defining “licence” as meaning “any permit, authorisation, concession or equivalent instrument that is granted or issued by, or pursuant to the authority of, a national or intergovernmental or other international body or authority, when acting in a regulatory capacity, to manufacture, launch, control, use or operate a space asset, or relating to the use of orbital positions or the transmission, emission or reception of electromagnetic signals to and from a space asset.”) I use the term “licence” in this broad sense in this article.

³⁶ John Dewar, ed. *International Project Finance: Law and Practice*, 3d ed (Oxford, United Kingdom: Oxford University Press, 2019) at 5.

³⁷ Goode, *Official Commentary on Space Assets Protocol*, *supra* note 1 at 197.

³⁸ *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, RES 2222 (XXI) [*Outer Space Treaty*], arts I, IV.

³⁹ *Ibid*, art II.

⁴⁰ Jack Wright Nelson, “Safety Zones: A Near-Term Legal Issue on the Moon” (2020) 44:2 J Space L 604 at 608.

⁴¹ Namely, the high seas and the airspace above the high seas.

the ordinary course of events, thereby distinguishing satellites from these other assets.⁴²

The regulatory environment in which satellites operate further separates satellites from ships and aircraft. At the international level, the International Telecommunications Union (“ITU”) implements the framework for the global coordination and management of radiofrequencies and orbital slots.⁴³ As Singapore’s Infocomm Media Development Authority (“SG Regulator”) summarises:

[O]rbital slots are valuable and limited resources, which need to be planned and managed for the efficient use of, and also, the avoidance of harmful interference between satellite networks. As such, the [ITU] has set out procedures and provisions. . . for the registration, coordination and operation of satellites.⁴⁴

The ITU regime is in addition to the obligations imposed on States under international law. The lack of territorial sovereignty in outer space does not mean that space is a “lawless void.”⁴⁵ Rather, the OST imposes “international responsibility” on “national activities in outer space”. The treaty also requires its parties to “authorise and continuously supervise” non-governmental space activities where they are the “appropriate State” to do so.⁴⁶ To facilitate this continuous supervision, the OST provides that States “retain jurisdiction and control” over space objects that they carry on their national registries.⁴⁷ Unfortunately, Singapore has not notified the United Nations of any such register. Nor is any such register publicly available through the SG Regulator. By contrast, Australia established its register in 2003,⁴⁸ and China established its register, which includes a dedicated Hong Kong component, in 2005.⁴⁹ Part III of this article explores the impact of these registers—or Singapore’s lack thereof.

To domestically implement their international obligations, many jurisdictions impose licensing requirements on space activities. For example, consider a

⁴² Patricia M Sterns & Leslie I Tennen, “Security Interests and Creditors’ Remedies in the Law of Outer Space” (1990) 33 *Proceedings on L Outer Space* 102 at 115.

⁴³ Goode, *Official Commentary on Space Assets Protocol*, *supra* note 1 at 15.

⁴⁴ Info-communications Media Development Authority, *Guidelines on Satellite Network Filing*, online: Info-communications Media Development Authority <<https://www.imda.gov.sg/-/media/Imda/Files/Regulation-Licensing-and-Consultations/Licensing/licenses/GuideSatelliteNetworkFiling.pdf?la=en#:~:text=Introduction-,1.1.,harmful%20interference%20between%20satellite%20networks>>.

⁴⁵ Frans G von der Dunk, “Sovereignty Versus Space - Public Law and Private Launch in the Asian Context” (2001) 5 *Singapore JICL* 22 at 29.

⁴⁶ *Outer Space Treaty*, *supra* note 38, art VI.

⁴⁷ *Ibid*, art VIII.

⁴⁸ United Nations Office for Outer Space Affairs (“UNOOSA”), *Index of Notifications by Member States and Organisations on the Establishment of National Registries of Objects Launched into Outer Space*, UN Doc ST/SG/SER.E/INF.15, online: UNOOSA <<https://www.unoosa.org/oosa/en/spaceobjectregister/national-registries/index.html>>.

⁴⁹ UNOOSA, *Index of Notifications by Member States and Organisations on the Establishment of National Registries of Objects Launched into Outer Space*, UN Doc ST/SG/SER.E/INF.17, online: UNOOSA <<https://www.unoosa.org/oosa/en/spaceobjectregister/national-registries/index.html>>. See also Jack Wright Nelson, “A Practitioner’s Guide to Hong Kong’s Outer Space Ordinance” (2019) 68:3 *German J Air & Space L* 387 at 392 [Nelson, “Hong Kong’s Outer Space Ordinance”].

Singaporean company that wishes to launch a satellite from Australia to provide communications services in Hong Kong. The satellite's TT&C installation will operate from Singapore, and the satellite will downlink to a Hong Kong ground station. This system would require multiple licences, including: an 'Orbital Slot License' issued by the SG Regulator under the *Telecommunications Act* ("SG Telecommunications Act");⁵⁰ an 'Australian launch permit' issued by the Australian Space Agency under the *Space (Launches and Returns) Act 2018* ("AU Space Act");⁵¹ and a 'Space Station Carrier Licence' issued by Hong Kong's Communication Authority ("HK Regulator"). Due to the strong and persistent defence and national security interests in space activities and technologies, export licences may also be required.⁵²

These licences have value independent of the orbiting satellite, and may even be more valuable than the satellite itself. As Larsen explains, a satellite is "useless without a cleared radiofrequency and an exclusive orbit."⁵³ Realising the value of these licences requires transfer to a new licensee, either directly or by gaining control of the licensed entity. However, transferring licences and changes in licensee control generally require regulator consent.⁵⁴ Overall, the locational and regulatory characteristics mean that a satellite will spend its entire operational life beyond territorial sovereignty yet be heavily regulated. I explore how these somewhat contradictory characteristics affect satellite security interests in the following part.

III. SATELLITE SECURITY INTERESTS

Whether it is project-based or asset-based, a satellite financing transaction will usually involve a satellite security interest in the form of a mortgage or a charge.⁵⁵

⁵⁰ *Telecommunications Act* (Cap 323, 2000 Rev Ed Sing), s 5B.

⁵¹ *Space (Launches and Returns) Act 2018* (Cth).

⁵² A space launch can constitute an export in and of itself. Consider, for example, the definition of "export" under Australia's *Export Control Act 2020*, s 12: "export means export from Australian territory to a place outside Australian territory." This is broad enough to capture the launch of a satellite to outer space from Australia.

⁵³ Paul B Larsen, "Small Satellite Legal Issues" (2017) 82:2 J Air L & Com 275 at 283.

⁵⁴ Goode, *Official Commentary on Space Assets Protocol*, *supra* note 1 at 177.

⁵⁵ This preference is due to practical and commercial reasons. The four forms of security interest available at common law—that is, charge, pledge, lien and mortgage—can be conceptualised in terms of possession and ownership. Possession refers to physical custody of an asset. Ownership means title to the asset. From a commercial perspective, a satellite operator can more readily part with ownership than possession. This is because they need to retain 'possession' of the satellite—in the sense of having control over the satellite—in order to generate revenue. To this end, a mortgagor and chargor both retain possession, whereas a pledgor and licensee retain ownership but not possession. Although constructive possession for pledges is possible, it is uncertain how this would be achieved for a satellite. While a transaction may involve a pledge of documents certifying title to a satellite (and I have seen this done in satellite financing documents governed by French law), this does not amount to a pledge of the satellites themselves under common law. This is because the bill of lading is the only document recognised at common law as a document of title to goods. See Ewan McKendrick & Roy Goode, *Goode and McKendrick on Commercial Law*, 6th ed (London: LexisNexis, 2020) [McKendrick & Goode, *Commercial Law*]. Ultimately, as Goode notes in his commentary, "the pledge, being possessory in nature, does not feature significantly in space finance" while a lien could only apply to a satellite "while on the ground, such as charges for storage or repair", *ibid* at 32. Title retention arrangements (such as finance leasing and conditional sales) are also possible. However, a lender may also be reluctant to enter into these arrangements, because they more closely involve the lender in the satellite supply transaction.

Australian law conceptualises these security interests significantly differently from Hong Kong and Singapore law. This difference arises due to Australia's adoption of the "functional" approach to secured transactions law. Australia's *Personal Property Securities Act 2009* ("PPSA") abolishes the distinctions between the various forms of security: instead, all transactions that involve an "interest in personal property" and that "secure payment or performance of an obligation" are simply "security interests" for PPSA purposes.⁵⁶

This 'functional' approach contrasts with the 'formalist' approach. As the latter's name suggests, this approach emphasises the 'form' of the security interest: that is, as a mortgage, charge, pledge, or lien.⁵⁷ Despite extensive and long-standing criticism,⁵⁸ Hong Kong and Singapore retain the formalist approach.⁵⁹ Accordingly, the common law predominates in both jurisdictions, as modified by legislation—primarily the *Companies Ordinance* ("HK Companies Ordinance")⁶⁰ and *Bills of Sale Ordinance* ("HK Bills of Sale Ordinance")⁶¹ in Hong Kong, and the *Companies Act* ("SG Companies Act")⁶² and *Bills of Sale Act* ("SG Bills of Sale Act")⁶³ in Singapore.

Despite the differences between the functionalist and formalist approaches, under the law of all three comparative jurisdictions, a security interest generally requires three distinct legal factors: to *attach*; to *perfect*; and to *take priority*.⁶⁴ A lender with such a security interest can then *enforce* that security interest against the world at large. Of these four factors, the statutory (in Australia) and common law (in Hong Kong and Singapore) priority rules are least affected by the locational and regulatory characteristics.⁶⁵ This is not because these rules are unimportant. On the contrary, taking priority over other creditors—and thereby avoiding a *pari passu* distribution—is a prime motivation for taking a security interest.⁶⁶ But the priority rules govern the ordering of claims, rather than their creation, publication, or assertion.⁶⁷ Accordingly, and while I raise priority issues, this part primarily analyses the attachment, perfection and enforcement of satellite security interests across the comparative jurisdictions. Throughout, the focus is on how the locational and regulatory characteristics affect each of these factors, thereby illustrating the novel challenges that satellite security interests present.

⁵⁶ *Personal Property Securities Act 2009* (Cth), s 12(1) [PPSA].

⁵⁷ Beale, *Law of Security*, *supra* note 1 at 11. See also McKendrick & Goode, *Commercial Law*, *supra* note 55 at 658.

⁵⁸ See generally, Williams, Lu & Ong, *Secured Finance Law*, *supra* note 17. See also Neo, "Secured Transactions Law in Singapore", *supra* note 17.

⁵⁹ For an overview of the debate, albeit pre-dating the PPSA, see Michael G Bridge *et al*, "Formalism, Functionalism, and Understanding the Law of Secured Transactions" (1999) 44 McGill LJ 567.

⁶⁰ *Companies Ordinance* (Cap 622, 2014 Hong Kong) [HK Companies Ordinance].

⁶¹ *Bills of Sale Ordinance* (Cap 20, 1886 Hong Kong) [HK Bills of Sale Ordinance].

⁶² *Companies Act* (Cap 50, 2006 Rev Ed Sing) [SG Companies Act].

⁶³ *Bills of Sale Act* (Cap 24, 2011 Rev Ed Sing) [SG Bills of Sale Act].

⁶⁴ Roy Goode & Louise Gullifer, eds. *Goode and Gullifer on Legal Problems of Credit and Security* (London: Sweet & Maxwell, 2017) at 1 [Goode & Gullifer, *Credit and Security*].

⁶⁵ This is best reflected by the fact that the *Space Protocol* only lightly modifies the simple priority rules established in the *Cape Town Convention*. See *Space Protocol*, *supra* note 16, art XXIII.

⁶⁶ McKendrick & Goode, *Commercial Law*, *supra* note 55 at 651.

⁶⁷ In particular, the priority rules can be varied by contract. For example, by an intercreditor or subordination agreement.

This comparative analysis is also informed by reference to the *Cape Town Convention* and the *Space Protocol*. At a high level, the *Cape Town Convention* aims to promote certainty and transparency in the financing of four categories of movable assets. To this end, the *Cape Town Convention* establishes general rules, while each asset category is detailed in a separate protocol as follows: aircraft equipment (“Aircraft Protocol”); railway rolling stock (“Rail Protocol”); space assets (“Space Protocol”); and mining, agricultural and construction equipment (“MAC Protocol”).⁶⁸

The primary way that the *Cape Town Convention* achieves its goal is by providing for the creation of “international interests” in these equipment categories. In line with the functionalist approach, an international interest can arise from a variety of financing structures, including secured loans as well as title reservation or leasing arrangements. But, as Saidova explains, the unique feature of the *Cape Town Convention* system is that an international interest is “autonomous”, as it “does not depend on any domestic law.”⁶⁹ Rather, these interests are intended to be registered on electronic, international registries, with priority and enforcement also determined within the confines of the *Cape Town Convention*. The interpretation and application of the *Cape Town Convention* largely relies on domestic courts, which are instructed to have “regard to the purposes as set forth in the preamble [to the *Cape Town Convention*], to its international character and to the need to promote uniformity and predictability in its application.”⁷⁰ Overall, the *Cape Town Convention* is a self-referential system for asset-based financing that is significantly insulated from domestic legal regimes.⁷¹

The *Rail*, *Space* and *MAC Protocols* are not in force. However, the success of the *Aircraft Protocol*, which entered into force in 2006, supports the thesis that underpins the broader *Cape Town Convention* project: namely, that an autonomous, predictable and transparent legal regime governing security interests in mobile equipment can benefit both borrowers (by reducing costs) and lenders (by reducing risks).⁷² But the *Aircraft Protocol* has not just lowered the costs and risks of aircraft financing. It has also opened the door to innovative new aircraft financing structures.⁷³ It is not unreasonable to posit that the implementation of the *Space Protocol* could have similar impacts for the satellite industry—a theme that I return to in Part IV of this article.

⁶⁸ UNIDROIT, *UNIDROIT Work and Instruments in the Area of Secured Transactions*, online: UNIDROIT <<https://www.unidroit.org/secured-transactions>>.

⁶⁹ Saidova, *Security Interests*, *supra* note 16 at 5. *Cape Town Convention*, *supra* note 16, art 2.

⁷⁰ *Cape Town Convention*, *supra* note 16, art 5(1).

⁷¹ *Cf* Havel & Mulligan, who point out that the extensive declarations and reservations that States can (and do) make within the *Cape Town Convention* system may undermine its supranational character, and even “re-nationalize” the system. See: Brian F Havel & John Q Mulligan, “The Cape Town Convention and The Risk of Renationalization: A Comment in Reply to Jeffrey Wool and Andrej Jonovic” (2014) 3 *Cape Town Convention J* 81 [Havel & Mulligan, “Renationalization of Cape Town Convention”].

⁷² Saidova, *Security Interests*, *supra* note 16 at 5.

⁷³ Gerard McCormack, “Secured Transactions Law Reform, UNCITRAL and the Export of Foreign Legal Models”, in N Orkun Akseli, ed. *Availability of Credit and Secured Transactions in a Time of Crisis* (Cambridge: Cambridge University Press, 2013) 33 at 39.

A. Attachment

Attachment refers to the creation of a security interest in respect of an asset that is “enforceable against the [borrower] as respects that asset.”⁷⁴ Across the comparative jurisdictions, a security interest will attach to a satellite per the security agreement and subject to statutory (in Australia)⁷⁵ or common law (in Hong Kong and Singapore)⁷⁶ requirements. Two key issues may impact this attachment process. First, whether a satellite security interest also attaches to insurance payments arising in respect of that satellite.⁷⁷ Second, whether a borrower requires regulatory consent before granting a satellite security interest. I address both issues in the following paragraphs. For simplicity, I refer to a *PPSA* security interest, as well as a mortgage or charge⁷⁸ under Hong Kong and Singapore law, as a “security interest.” I also use the term “security agreement” to refer to the written agreement that evidences the borrower’s debt and provides for the security interest across the comparative jurisdictions.⁷⁹

1. Insurance payments

A lender with a satellite security interest faces the risk that the satellite will be damaged or destroyed before the debt is repaid.⁸⁰ And, as I noted above, the locational characteristic means that satellite insurance has particular importance for lenders. Accordingly, a lender needs to ensure that they—rather than any other creditor—receive any insurance payments that may arise from the satellite.⁸¹

To this end, the *PPSA* provides that if “collateral” gives rise to “proceeds” then the relevant security interest “attaches to the proceeds, unless the [relevant] security

⁷⁴ McKendrick & Goode, *Commercial Law*, *supra* note 55 at 725; *PPSA*, *supra* note 56, s 19(1).

⁷⁵ A security interest will attach to a satellite—as a “good”—under the *PPSA* provided that the grantor is an “Australian entity” and subject to the fulfilment of two conditions. First, the borrower must have rights in the satellite or the power to transfer rights in the satellite to the lender. Second, either value is given for the security interest, or the borrower does an act by which the security interest arises. The first condition is typically fulfilled through the borrower’s ownership of the satellite. The second condition will usually be fulfilled by the borrower entering into a security agreement with the lender regarding the satellite. See: *PPSA*, *ibid*, s 6, 19.

⁷⁶ There are five relevant conditions at common law. First, there must be a security agreement that conforms with the statutory formalities. Second, the asset to be given in security must be identifiable as falling within the security agreement’s scope. Third, the borrower must have the power to give the asset in security. Fourth, there must be some current obligation of the borrower to the lender, or to another, which the asset is designed to secure. Fifth, any contractual conditions for attachment must have been fulfilled. See McKendrick & Goode, *Commercial Law*, *supra* note 55 at 730. For the first condition, no specific form of words is necessary to create a security interest under Hong Kong or Singapore law, but the intention to create a security interest must be clear from the terms of the security agreement. The second condition for the attachment of a security interest is less complex, as satellites are distinct and readily identifiable objects. The third condition is also unproblematic: it will be fulfilled via the satellite procurement agreement or other documentation issued by the manufacturer. Conditions four and five will be satisfied per the security agreement.

⁷⁷ Sundahl, *Cape Town Convention Application*, *supra* note 6 at 11.

⁷⁸ A “charge” is defined to include a “mortgage” in both the *HK Companies Ordinance*, *supra* note 60, s 333(1), and the *SG Companies Act*, *supra* note 62, s 4(1).

⁷⁹ This usage aligns with the definition of “security agreement” provided in *PPSA*, *supra* note 56, s 10, and the definition of “security agreement” provided in *Cape Town Convention*, *supra* note 16, art 1(ii).

⁸⁰ Sundahl, *Cape Town Convention Application*, *supra* note 6 at 108.

⁸¹ D’Angelo, *Aerospace Business Law*, *supra* note 5 at 102.

agreement provides otherwise.” “Collateral” means “personal property to which a security interest is attached”; “proceeds” is expressly defined to include “a right to an insurance payment. . . as indemnity or compensation for loss of, or damage to, the collateral.”⁸² Accordingly, a satellite security interest automatically attaches to insurance payments arising in respect of that satellite.

There is no such automatic attachment in Hong Kong and Singapore. Instead, a lender must seek alternative ways of ensuring that a satellite security interest also attaches to insurance payments. This can be achieved through appropriate drafting in the security agreement,⁸³ in which case a security interest will readily attach in favour of the lender. But, despite the apparent simplicity of this solution, case law across the common law world is replete with disputes over insurance payments and other forms of proceeds from secured assets.⁸⁴ To bypass these issues, a lender will usually insist on being named in the relevant insurance policy. In certain circumstances, this will also allow the lender to sue on the policy itself. But insurers may see a lender as more likely to litigate than a borrower. To counter this risk, insurers may raise premiums; they may even refuse to name lenders altogether. Seen in this light, automatic attachment is an efficient means of securing the lender’s interest in insurance payments, while leaving the borrower in place as the policyholder.

2. Regulatory consents

Subject to the details of the financing transaction, a regulator may consider a lender with a security interest over a satellite to own or control that satellite. This can make the transaction subject to regulatory consent requirements. Accordingly, a lender will insist that the security agreement includes a covenant from the borrower to comply with all regulatory and licensing requirements. I refer to this particular consequence of the regulatory characteristic as the ‘applicable law covenant’.

In all three jurisdictions, the terms of the security agreement are relevant to the attachment process.⁸⁵ Depending on the exact drafting, compliance with the applicable law covenant can be—in effect—an attachment requirement. However, even in well-settled areas of law, identifying the applicable law is often a complex exercise. For satellite activities, the complexity is further increased by the dual international-national regulatory regime. This is true in Australia and Singapore, where the relevant regulatory regime does not expressly address satellite security interests. Accordingly, it remains unclear if a borrower breaches the applicable law (and therefore

⁸² *PPSA*, *supra* note 56, s 10, 31(1)(b).

⁸³ Beale, *Law of Security*, *supra* note 1 at 236. See also Tsun Hang Tey, *Commentary and Cases on Personal Property Law* (Singapore: LexisNexis, 2011) at 1569 [Tey, *Personal Property Law*].

⁸⁴ See generally, Duggan & Brown, *Personal Property*, *supra* note 15 at 338. Lenders may resort to positing the existence of a fiduciary relationship in an attempt to assert a right to proceeds. Such a relationship would enable the lender to claim that the borrower holds the proceeds on trust. Notably, the *PPSA*, *supra* note 56, s 31(2), clarifies that “[p]roceeds are traceable whether or not there is a fiduciary relationship between the person who has a security interest in the proceeds. . . and the person who has rights in or has dealt with the proceeds.”

⁸⁵ It may be that these statutory requirements impede enforcement of the satellite security interest rather than attachment *per se*. In any event, these requirements should be considered first at the attachment stage. After all, a “security interest which cannot be enforced in any manner whatsoever is a theoretical abstraction”: McKendrick and Goode, *Commercial Law*, *supra* note 55 at 731.

the applicable law covenant) by granting a satellite security interest. By contrast, Hong Kong law specifically accounts for satellite security interests. In the following paragraphs, I address each jurisdiction in turn.

Operating a satellite from Hong Kong requires an ‘Outer Space Licence’. The HK Regulator issues this licence under the *Outer Space Ordinance* (“HK Space Ordinance”).⁸⁶ The HK Regulator invariably imposes an express condition on Outer Space Licences that restricts the holder of the licence from granting a security interest in the satellite without prior consent.⁸⁷ Compliance with licensing conditions is required under Hong Kong law.⁸⁸ Accordingly, in Hong Kong, compliance with the applicable law covenant will require regulatory consent where the satellite in question is operated under an Outer Space Licence.⁸⁹ It therefore appears that attachment of a satellite security interest in Hong Kong is subject to that same consent.

The situation in Australia is less clear. Australia does not have a direct equivalent of Hong Kong’s Outer Space Licence. However, a licence is required to utilise an orbital slot that is coordinated by the Australian Communications and Media Authority (“AU Regulator”). The available manual for this licence (“AU Orbital Slot Manual”) dates from 2012 and does not directly address security interests.⁹⁰ Nevertheless, obtaining this licence does require applicants to submit business plans and funding details to the AU Regulator to prove their “financial credentials”.⁹¹ Further, the AU Orbital Slot Manual requires notification to the regulator of “significant changes” to information submitted during the application process.⁹² It is unclear whether the AU Regulator would consider the granting of a satellite security interest to constitute a “significant change” that requires notification. However, prudence suggests that a borrower utilising an Australian-coordinated orbital slot consult with the regulator before granting a satellite security interest.

The situation in Singapore is similarly unclear. The SG Regulator requires that the holder of an ‘Orbital Slot Licence’ “effectively own at least 50% of the satellite to be operated in the slot throughout the duration of the licence.”⁹³ Would granting a satellite security interest dilute a licensee’s effective ownership of the satellite? The answer is not immediately apparent. For example, if the satellite security interest is a mortgage, the lender would hold the title to the satellite.⁹⁴ Conversely, if the

⁸⁶ *Outer Space Ordinance* (Cap 523, 1999 Hong Kong) [*HK Space Ordinance*].

⁸⁷ See, for example, the Outer Space Licence granted to APT Satellite Company Limited for the satellite ‘APSTAR 6C’, on file with author.

⁸⁸ *HK Space Ordinance*, *supra* note 86, s 11(1).

⁸⁹ And a variety of conditions may be imposed if the consent is granted—for example, the consent may limit the maximum amount that can be secured by the satellite.

⁹⁰ Australian Government, Australian Communications and Media Authority, *Australian Procedures for the Coordination and Notification of Satellite Systems*, online: Australian Communications and Media Authority <https://www.acma.gov.au/sites/default/files/2019-11/aust_procedures-coordination_notification_of_satellite_systems%20pdf.pdf> [*AU Orbital Slot Manual*].

⁹¹ *Ibid* at 6.

⁹² *Ibid* at 13.

⁹³ Info-communications Media Development Authority, *Guidelines on the Submission of Application for the Grant of Licence for the Use of Satellite Orbital Slot*, online: Info-communications Media Development Authority <<https://www.imda.gov.sg/-/media/Imda/Files/Regulation-Licensing-and-Consultations/Licensing/licenses/GuideSatelliteOrbitalSlotLic.pdf?la=en>>.

⁹⁴ Wee Ling Loo, *Law of Credit and Security* (Singapore: LexisNexis, 2012) at 193 [Loo, *Law of Credit and Security*].

satellite security interest is a charge, the borrower would retain the title (albeit an encumbered one).⁹⁵ This may motivate a lender to prefer a charge over a mortgage for a satellite security interest in Singapore. However, differentiating between charges and mortgages in this manner would be inconsistent with the Singapore *Companies Act*, which treats these charges and mortgages alike.⁹⁶ Ultimately, the inclusion of the word “effectively” grants the SG Regulator significant discretion. In this light, prudence suggests that a borrower with an Orbital Slot Licence consult with the regulator before granting a satellite security interest.

3. Discussion

The *PPSA* has the distinct advantage of providing for automatic attachment to proceeds. Conversely, in Hong Kong and Singapore, this arrangement needs to be replicated contractually. Of course, putting the necessary contractual arrangements in place would be second nature to many practitioners. And the ability to do may be viewed as a testament to the much-vaunted flexibility of the common law approach. Indeed, if some of the benefits of the *PPSA* can be reproduced contractually and within the confines of the common law security devices, this gives credence to the old adage against secured transactions law reform: “if it ain’t broke, don’t fix it.”⁹⁷

But providing for automatic attachment in Hong Kong and Singapore requires careful contract drafting. As D’Angelo notes, “[i]mprecision in contract wording, which often has the effect of shifting risk or liability from one party to the other, becomes particularly dangerous in a highly specialised field such as aerospace.”⁹⁸ This means that residual risk may remain, as insurance payments may ‘fall through the cracks’ of the security agreement, either through drafting errors or an unexpected interpretation. Thus, while the contractual solution may be appropriate in some contexts, it appears ill-suited to the satellite context. This is particularly the case when compared to the automatic attachment under the *PPSA*. Indeed, that automatic attachment to insurance proceeds is also a vital feature of the *Cape Town Convention* illustrates its importance in asset-based financing.⁹⁹

In and of itself, this insurance issue is unlikely to prevent a satellite financing transaction from taking place. But regulatory consent requirements are more problematic. The centrality of licences to a satellite system means that an applicable law covenant is essential in a security agreement. And compliance with the security agreement is an attachment ingredient in all three jurisdictions. Unfortunately, a borrower seeking to comply with an applicable law covenant faces significant uncertainty in Australia and Singapore. Interestingly, the same uncertainty may also arise with respect to the *Cape Town Convention*. The creation of an international interest requires that

⁹⁵ *Ibid* at 194.

⁹⁶ See n 78.

⁹⁷ Steven L Harris & Charles W Mooney Jr, “A Property-Based Theory of Security Interests: Taking Debtor’s Choices Seriously” (1994) 80:8 Va L Rev 2021 at 2052.

⁹⁸ D’Angelo, *Aerospace Business Law*, *supra* note 6 at 15.

⁹⁹ *Cape Town Convention*, *supra* note 16, art 1(w) (defining “proceeds” as meaning “money or non-money proceeds of an object arising from the total or partial loss or physical destruction of the object or its total or partial confiscation, condemnation or requisition). See also Goode, *Official Commentary on Space Assets Protocol*, *supra* note 1 at 444, 445.

the relevant security agreement “relates to an object of which the [borrower]. . . has power to dispose.”¹⁰⁰ The term “dispose” is not defined, and it is not stated when the power will arise. The *Space Protocol* does not shed further light on this issue, but does expressly state that it “does not affect the exercise by a Contracting State of its authority to issue licences, approvals, permits or authorisations for the launch or operation of space assets.”¹⁰¹ Accordingly, it is at least arguable that the power to dispose does not arise unless any required regulatory consents have been obtained.

This issue does not arise in Hong Kong, because the Outer Space Licence includes a licensing condition addressing satellite security interests. This points toward a simple solution: the Australian and Singapore regulators should update their guidance to address satellite security interests specifically. This, in turn, illustrates a broader point: that lawmakers could, by understanding and embracing the location and regulatory characteristics, resolve much of the uncertainty that currently inhibits asset-based satellite financing.¹⁰²

B. Perfection

An attached satellite security interest is enforceable between a lender and a borrower.¹⁰³ This contrasts with a perfected security interest, which is an attached security interest that is generally enforceable against third parties (including liquidators and other creditors).¹⁰⁴

Perfection formalities aim to give public notice of the security interest,¹⁰⁵ thereby avoiding the appearance of apparent wealth by a borrower. However, perfection is not a term of art in either Hong Kong or Singapore. The term is not used in either jurisdiction’s companies’ legislation. Conversely, the *PPSA* uses the term and is prescriptive as to the formalities required.¹⁰⁶ However, there is uncertainty regarding the perfection of a satellite security interest in all three comparative jurisdictions. The root cause of this uncertainty can be traced back to the locational characteristic. And this uncertainty is further complicated by certain features of each jurisdiction’s secured transactions law. In Australia, there are (confusingly and inexplicably) three different methods to perfect a satellite security interest. On the other hand, Hong Kong and Singapore have long-standing, registration-only systems—but they rely on archaic legislation.¹⁰⁷ The significant divergence concerning perfection warrants separate treatment of Australia as against Hong Kong and Singapore. Accordingly, this section addresses each in turn.

¹⁰⁰ *Cape Town Convention, ibid*, art 7(b).

¹⁰¹ *Space Protocol, supra* note 16, art XXVI(1).

¹⁰² This point is further developed in Part IV.

¹⁰³ See generally McKendrick & Goode, *Commercial Law, supra* note 55 at 725. In Australia, if the security interest attached via a security agreement (as would be expected for a satellite financing transaction), then the security interest will also be enforceable against third parties. See: *PPSA*, s 20(1). In this case, perfection will be directed at ensuring priority.

¹⁰⁴ Beale, *Law of Security, supra* note 1 at 423. See also McKendrick & Goode, *Commercial Law, ibid* at 725.

¹⁰⁵ McKendrick & Goode, *Commercial Law, ibid* at 725.

¹⁰⁶ *PPSA, supra* note 56, s 21(1), (2). However, the *PPSA* does not define the term.

¹⁰⁷ Tey, *Personal Property Law, supra* note 83 at 1605.

1. Australia

The *PPSA*'s three primary perfection methods¹⁰⁸ are as follows. First, by registration.¹⁰⁹ A satellite security interest can be perfected by registering a financing statement on the designated register.¹¹⁰ Second, by control.¹¹¹ Only security interests in certain kinds of collateral—seemingly, but not definitively including “satellites and other space objects”¹¹²—can be perfected by the lender taking control of the collateral. Third, by possession. That is, actual or apparent possession of the collateral by the lender.¹¹³

While registration is a straightforward process,¹¹⁴ control and possession are not. At common law, perfection by control is confined to pure intangibles (such as bank accounts).¹¹⁵ The *PPSA* reflects this common law position: “control” is defined in the *PPSA* by reference to Part 2.3 of the *PPSA*, which only addresses control of financial instruments.¹¹⁶ However, a separate *PPSA* provision seemingly provides for a “secured party” to perfect a security interest in “satellites and other space objects” by control. This dissonance is made more jarring by the legislative note that appears directly underneath the reference to “satellites and space objects”. This note states that “[f]or what constitutes. . . control of collateral, see Part 2.3”. The problem is that, as aforementioned, Part 2.3 does not mention satellites or space objects at all. Rather, Part 2.3 provides prescriptive guidance for every other type of asset capable of being perfected by control.¹¹⁷ So can a lender with a satellite security interest perfect it by control? And if so, how?

In the absence of legislative guidance or precedent, both questions remain open. In my view, the lack of reference to satellites in Part 2.3 does not mean that security interests in satellites cannot be perfected by control. This is because Section 23 states that “[c]ontrol of certain types of personal property is effective to perfect a security interest in the property (see paragraph 21(2)(c)).”¹¹⁸ Section 23 then refers to the existence of “special rules about control” of certain financial instruments. The existence of “special rules” indicates the subsistence of the more general rules relating to control—and it is these general rules that would govern the perfection by control of a satellite security interest.

¹⁰⁸ ‘Primary’ because temporary perfection, and perfection by the force of the *PPSA* itself, can arise under s 21(1)(a). These perfection methods are unlikely to arise in the satellite context; I do not consider them further.

¹⁰⁹ *PPSA*, *supra* note 56, s 21(2)(a) and generally Part 5.3.

¹¹⁰ Australian Government, Australian Financial Security Authority, *The Personal Property Securities Register*, online: Australian Financial Security Authority <<https://www.ppsr.gov.au/>>.

¹¹¹ *PPSA*, *supra* note 56, s 21(2)(c).

¹¹² *Ibid*, s 21(2)(c)(vi).

¹¹³ *Ibid*, s 24(1) and (2).

¹¹⁴ See generally chapter 6 of Duggan & Brown, *Personal Property*, *supra* note 15.

¹¹⁵ McKendrick & Goode, *Commercial Law*, *supra* note 55 at 758.

¹¹⁶ *PPSA*, *supra* note 56, s 21(2)(c).

¹¹⁷ *PPSA*, *ibid*, Part 2.3. See also Duggan & Brown, *Personal Property*, *supra* note 15 at 141.

¹¹⁸ While s 23 is titled “Guide to this Part”, it is not merely navigational or supplementary. Rather, it is as much a part of the *PPSA* as any other provision: *Australian Acts Interpretation Act 1901* (Cth), s 13(1). On this point I am grateful to Nicholas Baum for sharing his thoughts, as well as the relevant authorities, with me.

These general rules would likely come from what the *PPSA* calls the “general law”; that is, “the principles and rules of the common law and equity”.¹¹⁹ But it may also be possible to reason by analogy with the “special rules” that are given in Part 2.3 regarding other asset types.¹²⁰ For example, the *PPSA* definitively states the circumstances in which a secured party will control an intermediated security.¹²¹ One such circumstance is an agreement between the borrower, the lender and the intermediary that requires the intermediary to comply with the lender’s instructions.¹²² The position of a TT&C operator can be analogised, somewhat loosely, to that of an intermediary. Following this analogy, control could potentially be demonstrated via an agreement between the lender, the borrower and the TT&C operator that provides for the TT&C operator to follow the lender’s instructions following the borrower’s default. The persuasiveness of this analogy is likely lessened by the drastically different nature of the intermediation provided by a TT&C operator, as opposed to a financial institution. This is because an operator can choose to control their own satellites using their own ground station, or even rely on cloud-based and globally distributed TT&C services.¹²³ Conversely, in light of widespread dematerialisation, holding securities outside of a financial institution has become, in effect, an impossibility. In any event, what these speculations show is the uncertainty of perfecting a satellite security interest by control. As a purely practical matter, this means that a lender would be unlikely to attempt perfecting a satellite security interest by control.

The third perfection method available under the *PPSA* is possession. In *Knauf Plasterboard Pty Ltd v Plasterboard West Pty Ltd (In Liquidation)* (“*Knauf*”),¹²⁴ Markovic J of the Federal Court of Australia clarified that “possession” under the *PPSA* retains its common law meaning.¹²⁵ However, sections 24(1) and 24(2) of the *PPSA* limit this common law meaning such that constructive possession is not applicable.¹²⁶ This means that a lender’s contractual right to possess the collateral is insufficient. Instead, the lender must have actual or apparent possession.¹²⁷ To this end, the locational characteristic complicates questions of possession. Furthermore, these questions are not resolved by the *PPSA* itself.¹²⁸ Accordingly, and as with control, it is necessary to reason by analogy to explore how a satellite security interest could be perfected by possession.

In this respect, Scott LJ’s remark in *Thomas v Metropolitan Housing Corporation*¹²⁹ is instructive. His Lordship, considering whether a landlord had entered into

¹¹⁹ *PPSA*, *supra* note 56, s 10.

¹²⁰ The other collateral capable of being perfected by control are all financial instruments: *PPSA*, *ibid*, s 21(2)(c).

¹²¹ *PPSA*, *ibid*, s 26(2).

¹²² *PPSA*, *ibid*, s 26(2)(a)(i), (b)(ii).

¹²³ See *eg*, Amazon Web Services, *AWS Ground Station*, online: Amazon Web Services <<https://aws.amazon.com/ground-station/>>.

¹²⁴ [2017] FCA 866 [*Knauf*].

¹²⁵ *Ibid* at para 122.

¹²⁶ *Ibid* at para 128.

¹²⁷ *Ibid* at para 144.

¹²⁸ “Apparent possession” is explained in *PPSA*, *supra* note 56, s 126, although sub-paragraph (3) of this section states that it does not apply with respect to perfection.

¹²⁹ [1936] 1 All ER 210 (EWCA).

possession of premises by receiving the tenant's key to those premises, held that

[a]ctual possession of empty premises, or of chattels which are locked up within a building or in a package of some sort, is retained by retaining the key. Possession of the key gives actual possession.¹³⁰

This case did not relate to security interests. And it is arguable that possession of a key fails to fulfil the critical function of perfection—that is, public notice of the existence of the security interest. Nonetheless, analogising this general principle to the satellite security interest context, the ‘key’ to a satellite is the command codes necessary to operate the satellite. Possession of the command codes could therefore be considered possession of the satellite for the purposes of the *PPSA*. Indeed, this particular solution features in the *Space Protocol*, which anticipates an arrangement where “command codes and related data and materials” are placed with a third party to afford the lender “an opportunity to take possession of, establish control over or operate the space asset.”¹³¹ However, possession, per section 24(1) of the *PPSA*, must be exclusive.¹³² Exclusive possession of the codes by the lender would be impractical, because the borrower (or its TT&C operator) would need the codes to operate the satellite. Thus, this method of perfection remains largely theoretical in respect of satellites. This leaves registration as the only truly practical perfection method for satellite security interests in Australia.

2. Hong Kong and Singapore

There are three key perfection methods in Hong Kong and Singapore: possession, registration, and notice.¹³³ Of these, only registration is potentially relevant in respect of a satellite security interest. This is because a satellite security interest will typically be a charge¹³⁴ granted by a company¹³⁵ under each jurisdiction's companies' legislation.

A satellite security interest is *prima facie* registrable in each jurisdiction. However, registration is a purely statutory perfection method,¹³⁶ and only certain specific charges are registrable in both jurisdictions.¹³⁷ Unfortunately, no clear logic

¹³⁰ *Ibid* at 216. See also Goode & Gullifer, *Credit and Security*, *supra* note 64 at 5.

¹³¹ *Space Protocol*, *supra* note 16, art XIX.

¹³² This section provides that “[a] secured party cannot have possession of personal property if the property is in the actual or apparent possession of the grantor or debtor, or another person on behalf of the grantor or debtor.”

¹³³ Loo, *Law of Credit and Security*, *supra* note 94 at 197. See McKendrick & Goode, *Commercial Law*, *supra* note 55 at 751, 752.

¹³⁴ Recall that a satellite security interest will typically be in the form of a mortgage or a charge, and further that a “charge” is defined in both the *HK Companies Ordinance* and the *SG Companies Act* to include a “mortgage”.

¹³⁵ A charge granted by an individual would be subject to the *HK Bills of Sale Ordinance* or the *SG Bills of Sales Act*. The circumstances in which a natural person would own a commercial satellite and grant security over it are difficult to imagine.

¹³⁶ McKendrick & Goode, *Commercial Law*, *supra* note 55 at 752.

¹³⁷ *HK Companies Ordinance*, *supra* note 60, s 334(1); *SG Companies Act*, *supra* note 62, s 131(3).

underpins the list of registrable charges in either jurisdiction.¹³⁸ For example, the companies' legislation in both jurisdictions specifies that ship and aircraft charges are registrable.¹³⁹ But nothing is stated regarding the registrability of charges over other movable assets, such as satellites.

As a 'catch-all', in both Hong Kong and Singapore "a charge created or evidenced by an instrument that, if executed by a natural person,¹⁴⁰ would require registration as a bill of sale,"¹⁴¹ is a registrable charge. What amounts to a "bill of sale" is unclear. In Hong Kong it has been recognised that "bill of sale" should be interpreted in line with the HK Bills of Sale Ordinance.¹⁴² The same likely applies in Singapore.¹⁴³ The effect is that a charge created by a company over goods is generally registrable in both jurisdictions.¹⁴⁴

Despite not being precisely defined in either jurisdiction, satellites appear likely to be considered "goods" under both Hong Kong and Singapore law.¹⁴⁵ A satellite security interest will invariably be granted by a company. Accordingly, a satellite security interest is *prima facie* a registrable charge. But the bills of sale legislation in both jurisdictions contains extensive exclusions. In particular, the Hong Kong legislation expressly excludes from the definition of "bill of sale" a bill of sale in respect "of goods in any place outside Hong Kong or at sea."¹⁴⁶ Similarly, the Singapore legislation excludes "bills of sale of goods in foreign parts or at sea."¹⁴⁷

Do these exclusions mean that a security agreement covering an orbiting satellite is not a "bill of sale", because such a satellite is "outside Hong Kong" or "in foreign parts"? This appears to be the case if a purposive interpretative posture is adopted.¹⁴⁸ Such a posture may interpret the exclusion as excluding bills of sale in respect of

¹³⁸ Ministry of Finance, *June 2011 Report of the Steering Committee for Review of the Companies Act*, online: Ministry of Finance <<https://www.acra.gov.sg/docs/default-source/default-document-library/legislation/listing-of-consultation-papers/public-consultation-on-the-review-of-the-companies-act-and-regulatory-frame-work-for-foreign-entities/SCReportComplete28Jul.pdf>> [Ministry of Finance, 2011 *Companies Act Review*].

¹³⁹ *HK Companies Ordinance*, *supra* note 60, s 334(1)(g), (h) and (j); *SG Companies Act*, *supra* note 62, s 131(3)(g), (i).

¹⁴⁰ The *SG Companies Act* uses "an individual" in place of "a natural person".

¹⁴¹ *HK Companies Ordinance*, *supra* note 60, s 334(1)(b); *SG Companies Act*, *supra* note 62, s 131(3)(d).

¹⁴² *Re Far East Structural Steelwork Engineering Limited* [2005] HKEC 763 (Court of First Instance) at para 41.

¹⁴³ See *In Re Bonds, Ltd* [1922] 02 Federated Malay States LR 263 (Court of Appeal). In this case, the registrability of a charge under the relevant companies legislation depended on whether it was a "bill of sale". The Court determined this issue by reference to the *Bills of Sale Enactment* (No 26 of 1919, vol III of the Laws of the Federated Malay States). This enactment is materially similar to the *SG Bills of Sale Act*.

¹⁴⁴ Financial Services & the Treasury Bureau, *Second Public Consultation on Companies Ordinance Rewrite*, at paras 5.13-5.14, online: Financial Services & the Treasury Bureau <https://www.cr.gov.hk/en/publications/docs/042008_brief-e.pdf>.

¹⁴⁵ As they are "chattels personal". See *Sale of Goods Ordinance* (Cap 26, 1896 Hong Kong), s 2 (definition of "goods"); *Sale of Goods Act* (Cap 393, 1999 Rev Ed Sing), s 61(1) (definition of "goods", which inverts the phrase as "personal chattels").

¹⁴⁶ *HK Bills of Sale Ordinance*, *supra* note 61, s 2.

¹⁴⁷ *SG Bills of Sale Act*, *supra* note 63, s 3(1)(e). Prior to 1 July 1997, the wording in the *HK Bills of Sale Ordinance* was the same.

¹⁴⁸ Purposive interpretation is endorsed by statute in both jurisdictions: see s 19 of Hong Kong's *Interpretation and General Clauses Ordinance* (Cap 1, 1966 Hong Kong) and s 9A of Singapore's *Interpretation Act* (Cap 1, 2002 Rev Ed Sing).

goods in any place *other* than Hong Kong or Singapore.¹⁴⁹ On the other hand, the companies' legislation in both jurisdictions anticipates registrable charges arising in respect of property located outside of Hong Kong and Singapore.¹⁵⁰ Further, while an orbiting satellite is undoubtedly "outside Hong Kong", it is less clear that such a satellite is "in foreign parts" per the Singapore *Bills of Sale Act*.¹⁵¹

Of course, "foreign" could be interpreted as simply meaning 'outside of Singapore'. It could also be interpreted (more textually) as meaning 'in States other than Singapore'. While the former interpretation would exclude outer space, the latter would not. Indeed, whether outer space is "foreign" to any Earth-bound jurisdiction is something of a conceptual rabbit-hole.

Overall, the uncertainty introduced by the locational characteristic further illustrates the defects of the Hong Kong and Singapore registration regimes. Commentators and law reform commissions have consistently criticised the reliance of these regimes on the "onerous and tedious" bills of sale legislation.¹⁵² But these defects have not gotten in the way of commercial practice in either jurisdiction. Rather, the consequences of non-registration¹⁵³ effectively compel registration of charges even where their registrability is unclear. Accordingly, practitioners in Hong Kong and Singapore habitually register a wide variety of security interests.¹⁵⁴

The same could be expected for satellite security interests. Accordingly, registration of a charge over an orbiting satellite would invariably be sought. And the relevant regulators¹⁵⁵ appear unlikely to reject these registrations due to the exclusions set out in the bills of sale legislation.

3. Discussion

In Australia, three different perfection methods are theoretical available in respect of satellite security interests. While only one—registration—is available in practice, the apparent abundance of choice is unsatisfactory; it introduces far more uncertainty than is found in the 'unreformed' common law of Hong Kong and Singapore. In

¹⁴⁹ This interpretation aligns with that set out in the only monograph I have identified that focuses on the bills of sales legislation in the Asia-Pacific. See Kala Anandarajah, *The Bills of Sale in Singapore and Malaysia* (Singapore: Butterworths Asia, 1995) at 19 ("[w]here the goods are situated at a foreign port [sic—the author presumably meant to write 'part'] or at sea at the time of the execution of the bill of sale, the registration requirements of the [SG Bills of Sale] Act will not apply.")

¹⁵⁰ *HK Companies Ordinance*, *supra* note 60, s 335(5)(b)(ii); *SG Companies Act*, *supra* note 62, s 131(4).

¹⁵¹ This argument is on the fact that "in foreign parts" is followed by "or at sea" in the *SG Bills of Sale Act*, *supra* note 63. This indicates that "at sea" is not in foreign parts. Similarly, outer space can be analogised to "at sea", such that being in outer space is not the same as being in foreign parts.

¹⁵² Loo, *Law of Credit and Security*, *supra* note 94 at 238.

¹⁵³ In both jurisdictions, failure to register a registrable charge in accordance with the legislation means that the lender will not be able to enforce their security in the event of the borrower's insolvency as against the liquidator and the borrower's other creditors, although the lender can still sue for the debt itself: *HK Companies Ordinance*, s 337; *SG Companies Act*, s 131(1), (2).

¹⁵⁴ Ministry of Finance, *2011 Companies Act Review*, *supra* note 138, explaining that "most banks and law firms attempt to register charges on behalf of their clients under section 131(3) of the [SG] Companies Act, even if the charges do not really fit into any of the registrable categories or items listed in section 131(3)." I am aware from my own experience that a similar situation prevails in Hong Kong.

¹⁵⁵ The Companies Registry in Hong Kong, and the Accounting and Corporate Regulatory Authority in Singapore.

particular, perfection by control in respect of a satellite is likely available, and confers greater priority than perfection by registration or by possession.¹⁵⁶ To illustrate the potential problems here, consider a lender that has perfected a satellite security interest by registration only. Unbeknownst to the lender, the borrower decides to outsource TT&C to a third-party provider. This TT&C provider takes a security interest over the satellite to secure their fees. In a priority dispute, the TT&C provider's perfection by control would trump the lender's perfection by registration, despite being later in time. To avoid this, the lender must ensure that they have deep visibility and control over a satellite's TT&C arrangements. But requiring this level of lender engagement, and compelling multiple perfection methods in this manner, is not the mark of a sophisticated process.

Indeed, the inclusion of perfection by control for satellites in the *PPSA* is somewhat inexplicable. It appears to be based on the idea that satellites are, like the other assets that are capable of perfection by control under the *PPSA*, intangible due to their location in outer space. But this would be a misunderstanding of the locational characteristic. This characteristic does make it difficult to determine the location of a satellite at any particular time—the location may depend on the purpose for which that determination is made. But this does not mean that the satellite should be viewed as an intangible.

Alternatively, it may be the *PPSA*'s provision for perfection by control is intended to reflect that satellites, like certain financial instruments, are intermediated, due to their reliance on TT&C services. However, as I described above, the nature of this intermediation is drastically different. In any event, and regardless of legislative intent, the availability of multiple perfection methods—even if only in theory—for satellite security interests under the *PPSA* causes more problems than it solves. To this end, a review of the *PPSA*, commissioned by the Australian Attorney-General, recommended removing the ability to perfect a satellite security interest by control.¹⁵⁷ Unfortunately, the review has not yet resulted in changes to the *PPSA*, leaving the perfection of satellite security interests a messy state of affairs in Australia (in theory, and potentially in practice as well).¹⁵⁸

Hong Kong and Singapore's registration-only regimes form their basis (in part) on the archaic bills of sale legislation. This legislation is "cumbersome and onerous".¹⁵⁹ And, as outlined above, this legislation may exclude orbiting satellites entirely. Nonetheless, practice suggests (and prudence demands) that a lender should seek registration of a satellite security interest in Hong Kong and Singapore. As this registration is likely to be accepted, this makes for an intriguing example of a system that works in practice, even if not in theory. It is also further evidence of what Neo refers to as "the general untidiness of the law" which is "accepted and tolerated by the local legal and financial community, who have developed their practices

¹⁵⁶ *PPSA*, *supra* note 56, s 57(1).

¹⁵⁷ Australian Government Attorney-General's Department, Bruce Whittaker, *Review of the Personal Property Securities Act 2009: Final Report*, at 146, online: Attorney-General's Department <<https://www.ag.gov.au/legal-system/publications/review-personal-property-securities-act-2009-final-report>>.

¹⁵⁸ Anthony Duggan, "Personal Property Securities Law Reform in Developed Jurisdictions" in Gullifer & Neo, *Secured Transactions*, *supra* note 10, 51 at 65.

¹⁵⁹ Neo, "Secured Transactions Law in Singapore", *supra* note 17 at 401.

and processes accordingly.”¹⁶⁰ The challenge is how to integrate satellite security interests within this framework, without adding to the untidiness.

The Australian, Hong Kong and Singapore perfection regimes all appear unduly complex when compared against the *Cape Town Convention*'s single perfection method. As Saidova explains, a registration within the *Cape Town Convention* system “allows a registrant to give notice of the international interest's existence to third parties, secure its priority among competing interest holders and ensure that the registered interest is effective in the case of the [borrower]'s insolvency.”¹⁶¹ Such a register is currently in place—and operating successfully¹⁶²—for international interests in aircraft under the *Aircraft Protocol*.¹⁶³ The *Space Protocol*, were it to enter into force, would likely implement a similar register.

C. Enforcement

As Saidova remarks, the strength of a security interest is “truly put to the test when the [borrower] defaults or becomes insolvent.”¹⁶⁴ To this end, a lender with an attached and perfected satellite security interest will be looking to enforce that security interest against the world at large. There are no statutory provisions in Australia, Hong Kong or Singapore that specifically govern the enforcement of a satellite security interest. However, Chapter 4 of the *PPSA* does address the enforcement of security interests generally. By contrast, in Hong Kong and Singapore, enforcement can differ according to the form of the security interest.¹⁶⁵ But across all jurisdictions, primary effect is given to the enforcement methods agreed in the security agreement. To this end, the typical enforcement methods are possession and sale,¹⁶⁶ appointment of a receiver or foreclosure.¹⁶⁷ However, the locational and regulatory characteristics impact each of these methods. In particular, the locational characteristic highlights a potential lacuna in Chapter 4 of the *PPSA*. And, the regulatory characteristic means that enforcement across the comparative jurisdictions is likely to involve regulator coordination and

¹⁶⁰ *Ibid* at 398.

¹⁶¹ Saidova, *Security Interests*, *supra* note 16 at 11.

¹⁶² *Ibid*.

¹⁶³ *Ibid* at 5.

¹⁶⁴ *Ibid* at 174.

¹⁶⁵ For example, the holder of a charge that does not also constitute a mortgage would typically only have the power of sale and appointment of a receiver. Foreclosure is not possible, because that remedy involves the extinguishing of the equity of redemption, and no such equity is involved in a charge.

¹⁶⁶ Beale, *Law of Security*, *supra* note 1 at 625.

¹⁶⁷ McKendrick & Goode, *Commercial Law*, *supra* note 55 at 740. See also Duggan & Brown, *Personal Property*, *supra* note 15 at 362. Enforcement can also occur at the entity level, for example by exercising ‘step-in’ or ownership rights in respect of the entity that owns the satellite. This method can be used to circumvent the non-assignability of licences. But taking security at the entity level is a hallmark of a project-, rather than asset-, based structure. Further, a change of control is likely to require notification to the relevant regulator. Such a change of control may be deemed to be a transfer. Consequently, the licence may not survive the change in control. Boyce also raises the potential disadvantage to the lender, who “as a successor-owner” could be “exposed to liabilities (taxes, employment claims, and other) which it never anticipated or bargained for.” Timothy J Boyce, “Collateralizing Nonassignable Contracts, Licenses, and Permits: Half a Loaf Is Better than No Loaf” (1997) 52:2 Business Lawyer 559 at 561. I also note here that the *PPSA* envisages security interests in licences, but that taking such an interest does not cure the issues arising from the regulatory characteristic.

approvals—which may not be forthcoming, thereby negating the value of ‘self-help’ remedies set out in the security agreement, even where the borrower is cooperative. I address both issues in the following paragraphs.

1. *Locational impact*

A lender looking to enforce a satellite security interest may run into operational difficulties resulting from the satellite’s location in outer space.¹⁶⁸ These problems are not insurmountable where the TT&C installation is within the jurisdiction, and therefore subject to court process. But in Australia, the location characteristic has a particular impact on enforcement. This is because the entirety of Chapter 4 does not apply to “security interests in goods” that are “located outside Australia”.¹⁶⁹

Satellites are “goods” and therefore “personal property” under the *PPSA*.¹⁷⁰ And, they seem certain to be located outside of Australia. To this end, Section 235 establishes how the “location” of personal property is determined for *PPSA* purposes. This section relevantly provides that “personal property. . . is located in the particular jurisdiction in which the personal property is situated.”¹⁷¹ It also provides rules for determining the location of “investment instrument[s]”, “negotiable instrument[s]” and “chattel paper”.¹⁷² However, Section 235 does not provide any rules specifically addressing the location of orbiting satellites. The apparent result is that an orbiting satellite is not within the scope of Chapter 4.

Various counterarguments can be made here. For example, it could be argued that a satellite that is carried on the Australian national register should be considered as being located in Australia. This argument would rely on Australia’s jurisdiction and control over that satellite¹⁷³ being tantamount to location. Its success would illustrate the advantages of implementing a national register to jurisdictions such as Singapore, which currently lacks such a register. A similar argument could be made regarding a satellite that utilises an Australian-coordinated orbital slot. But both arguments come up against the plain words of the *PPSA*. The text does not suggest that “location” should be interpreted to mean anything other than physical location, except where investment instruments, negotiable instruments and chattel paper are involved. Further, both arguments conflict with the lack of territorial sovereignty in outer space. This is because a court accepting these arguments would, at least in theory, treat a part of outer space as being located in Australia. Accordingly, it appears that an orbiting satellite is located outside Australia for *PPSA* purposes, with the consequence that Chapter 4 will not apply to satellite security interests.

The impact of this result is difficult to determine. In the event of a dispute as to enforcement, Duggan and Brown note that “[t]he difficulty. . . if the *PPSA* enforcement provisions do not apply [is that]the court must look elsewhere to fill the gap.”¹⁷⁴

¹⁶⁸ Goode, *Official Commentary on Space Assets Protocol*, *supra* note 1 at 197.

¹⁶⁹ *PPSA*, *supra* note 56, s 109(2).

¹⁷⁰ *PPSA*, *ibid*, s 10 (definition of “goods”). This definition expressly includes “satellites and other space objects.”

¹⁷¹ *PPSA*, *ibid*, s 235(1).

¹⁷² *PPSA*, *ibid*, s 235(2).

¹⁷³ *Outer Space Treaty*, *supra* note 38, art VIII.

¹⁷⁴ Duggan & Brown, *Personal Property*, *supra* note 15 at 458.

To this end, it appears that an Australian court “must instead look to the general [Australian] law governing enforcement of security interests.”¹⁷⁵ Presumably, this would give primacy to the remedies set out in the security agreement itself—as is the case in Hong Kong and Singapore. For example, the security agreement may grant the lender the right to change the satellite’s command codes following a default, thereby obtaining sole control of the satellite.

The situation could become further complicated if the dispute had a connection to both Australia and another jurisdiction, such that a conflict of laws issue arose. Typically, the conflict of laws rules would point to the location of the good—commonly referred to as the *lex situs*. However, there is no clear *lex situs* in outer space. Nor is there precedent for adopting the law of the state of registration (as is done for ships and aircraft when they are in or over the high seas).¹⁷⁶ So the question remains, once again, an open one.

This contrasts drastically with the solution offered by the *Cape Town Convention*. The autonomous nature of an international interest removes the need to resort to conflicts of law rules.¹⁷⁷ Instead, the existence and validity of an international interest in a satellite would be determined in accordance with the *Cape Town Convention* and the *Space Protocol*, with enforcement also subject to this framework.

2. Regulatory impact

I have previously described the impact that the regulatory characteristic has on the attachment of satellite security interests. Those attachment issues arose due to the restrictions imposed by regulators on the ownership and control of satellites and their associated orbital slots. Any enforcement action that involves a change in ownership or control will face these same issues; indeed, these issues are likely to be more acute for enforcement. This is because some enforcement methods—namely possession and sale, and foreclosure—involve actual transfers,¹⁷⁸ not just the acquisition of interests.

The AU Orbital Slot Manual further illustrates this issue. Under the heading “[t]ransfer of satellite systems,” the manual states the Australian Telecommunication Regulator’s view that “information and parameters related to satellite systems submitted to the ITU”—in other words, an Australian-coordinated orbital slot—are not “an asset to be traded.”¹⁷⁹ This non-transferability means that a lender seeking to foreclose on a satellite in an Australian-coordinated orbital slot needs to consult with the AU Regulator. Of course, the purchaser of the foreclosed satellite may wish to move it to a different orbital slot eventually. But if the purchaser intended to keep the satellite in that slot, they would need to make a fresh application to the regulator. However, amongst other requirements, an applicant for Australian orbital slot coordination must be “a company . . . incorporated in Australia,” that “carries on business

¹⁷⁵ *Ibid.*

¹⁷⁶ This law is sometimes referred to as the *lex registrii*. Art I(3) of the *Space Protocol*, *supra* note 16, also suggests this solution. See: Goode, *Official Commentary on Space Assets Protocol*, *supra* note 1 at 229.

¹⁷⁷ Saidova, *Security Interests*, *supra* note 16 at 4.

¹⁷⁸ In the former case, to a purchaser, in the latter case, to the lender.

¹⁷⁹ *AU Orbital Slot Manual*, *supra* note 90 at 23.

in Australia and has management staff in Australia.”¹⁸⁰ An offshore purchaser may face difficulties meeting these requirements.

This issue also arises in Hong Kong in respect of Outer Space Licences. Unlike an Australian-coordinated orbital slot, these licences are transferable (subject to regulatory approval).¹⁸¹ However, as in Australia, there are restrictions on who can hold these licences. In particular, an Outer Space Licence can only be issued to a “body corporate incorporated under the laws of Hong Kong.”¹⁸² Further, as I described above concerning attachment, the borrower would need to have obtained regulatory approval before granting the security interest to the lender.

I turn now to the Singapore *Telecommunications Act*.¹⁸³ No particular provision of this legislation addresses the transferability of licences. Nonetheless, as in Australia, it appears likely that a new application would be required—and, again, there are restrictions on who can hold these licences. For example, the holder of an Orbital Slot Licence must be a company incorporated in Singapore that, as previously described, effectively owns at least 50% of the satellite to be operated in the slot.¹⁸⁴ Again, the exact meaning of “effectively own” is unclear. But a lender looking to enforce a satellite security interest would need to keep this ratio in mind.

3. Assessment

The locational characteristic means that Chapter 4 of the *PPSA* likely does not apply to a satellite security interest. In certain circumstances, this may raise the interesting issue of the lack of *lex situs* in outer space. Nevertheless, as a practical matter the position under Australian law for a satellite security interest appears to be akin to the position in Hong Kong and Singapore—namely, that the primary reference is to the enforcement methods set out in the security agreement. However, the regulatory characteristic heavily restricts the enforcement of satellite security interests across the comparative jurisdictions. These restrictions illustrate an important point: that a licence is in the gift of the regulator. And a satellite cannot generally be operated—commercially, or at all—without its licences. Indeed, even a satellite’s continued existence in a part of outer space—that is, utilising an orbital slot—requires licensing and international coordination.

To this end, Nesgos notes that the security agreement will frequently “require the cooperation of the [borrower] in obtaining necessary governmental approvals for the sale or use of space-based property and the transfer of operating authorisations.”¹⁸⁵ However, this is simply a contractual requirement imposed on the borrower: it cannot displace each jurisdiction’s mandatory rules and regulatory discretion. And this discretion is jealously guarded: it is notable that the *Cape Town Convention* contains an “elaborate system of remedies”,¹⁸⁶ but that the *Space Protocol* includes an express

¹⁸⁰ *Ibid* at 6.

¹⁸¹ *HK Space Ordinance*, *supra* note 86, s 7(1).

¹⁸² *HK Space Ordinance*, *ibid*, s 5(1). See also Nelson, “Hong Kong’s Outer Space Ordinance”, *supra* note 49 at 403.

¹⁸³ *Telecommunications Act*, *supra* note 50.

¹⁸⁴ See n 93.

¹⁸⁵ Nesgos, “Commercial Space Law”, *supra* note 3 at 436.

¹⁸⁶ Saidova, *Security Interests*, *supra* note 16 at 5.

provision preserving State powers over licences.¹⁸⁷ So while the *Space Protocol* can ameliorate the jurisdictional issues arising from the locational characteristic, it cannot avoid the regulatory characteristic's adverse impacts.

Ultimately, any enforcement method will require careful attention to transferring licences (where possible), or surrendering existing licences and obtaining replacement licences. It may involve relocating the satellite from one orbital position to another—a complex and costly process. This indicates that the appointment of a receiver is the most practicable of the various enforcement methods. This is because the receiver is the agent of the borrower (who is likely the licensee), rather than of the lender.¹⁸⁸ Accordingly, the appointment of a receiver can avoid a formal transfer of ownership or control over the asset.

In any event, the regulatory characteristic means that a lender looking to enforce a satellite security interest needs to consult with the relevant regulator first. I note that the need to consult negates the utility to the lender of 'self-help' remedies under the security agreement. This impact may be justified by the strong public interests in transparency and supervision regarding space activities. Nevertheless, I suggest that the relevant regulators should proactively provide guidance on this issue, even if this guidance merely confirms that the regulator requires notice prior to enforcement. As a practical step, a lender could request that the regulator provide assurances regarding licence transfer following an event of default. A lender could also obtain legal opinions addressing this issue. Whether such assurances or opinions provide sufficient comfort is a commercial question. But in the absence of regulatory guidance addressing the enforcement of satellite security interests, and given that a regulator's views on enforcement may not align with the lender's,¹⁸⁹ uncertainty is likely to prevail.

IV. CONCLUSION

Satellite security interests face numerous legal obstacles across Australia, Hong Kong and Singapore. To answer the question posed in the introduction to this article, it appears that a lender can take a security interest over an orbiting satellite in the comparative jurisdictions—but this security interest may not provide the lender with

¹⁸⁷ *Space Protocol*, *supra* note 16, art XXVI. Given that treaties like the *Cape Town Convention* and its protocols do not usually affect a State's regulatory laws, Goode remarks that this article was "inserted *ex abundante cautela* at the particular insistence of a few negotiating States whose concerns the other negotiating States agreed to accommodate." See Goode, *Official Commentary on Space Assets Protocol*, *supra* note 1 at 227. This demonstrates just how intractable the regulatory characteristic may be, and indeed how its impact is likely to vary drastically from State to State.

¹⁸⁸ This is a well-established principle in common law jurisdictions, and remains the law in Hong Kong and Singapore. It also remains true in Australia, see *Expo International Pty Ltd v Chant* [1979] 2 NSWLR 820 (NSW Supreme Court), save as amended by sections 420 and 420A of the *Corporations Act 2001* (Cth). English courts have, however, imposed limits on the scope of a receiver's agency, and restricted it in part: see generally Eversheds Sutherland, James Williams, *Do Receivers Have Overreaching Powers? Stanley v A Debtor (2019) (Unreported)*, online: Eversheds Sutherland <https://www.eversheds-sutherland.com/global/en/what/articles/index.page?ArticleID=en/Financial_service_s/overreaching-powers-050419>. I have not identified any Australian, Hong Kong or Singapore judgments that evidence the same concerns.

¹⁸⁹ This is a particular issue if the satellite in question provided a public service. Cf *Space Protocol*, *supra* note 16, art XXVII.

meaningful recourse. In short, the locational and regulatory characteristics introduce significant complexity, as exemplified by the many open questions that this article has identified. Unfortunately, as Cunningham explains, these:

speculation[s] inspire little confidence in secured parties [such as lenders]. At bottom, one cannot divine a court's resolution of these issues until the decision is rendered, and even then the courts are unlikely to adopt consistent rules of decision without legislative guidance.¹⁹⁰

The result is that a lawyer sitting in Sydney, Hong Kong or Singapore may find themselves unable (or unwilling) to issue a clean opinion on the security arrangements underpinning a proposed asset-based satellite financing. Instead, in the absence of regulatory clarity, “lawyers are left to ponder the unfamiliar and ambiguous legal environment of [space] ventures’ extraordinary commercial activities.”¹⁹¹ Unfortunately, such pondering is of little comfort (or value) to a lender.

The lack of clarity regarding satellite security interest is not surprising. As D’Angelo remarks, while “commercial activities in space have greatly expanded, the applicable laws lag far behind.”¹⁹² The *PPSA* is a notable attempt to proactively address satellite security interests by, for example, specifying that satellites can be the subject of a security interest. But, ultimately, the *PPSA*’s treatment of satellites is incomplete. The *PPSA* tends to give rise to more questions than it solves, particularly concerning perfection. On the other hand, the secured transactions regimes in Hong Kong and Singapore are well past their use-by date.¹⁹³ These regimes are only workable due to the willingness of practitioners to, in Neo’s phrasing, “liv[e] with untidiness”.¹⁹⁴ But when it comes to satellites, relying on such a patchwork is imprudent, particularly when it comes to critical issues such as insurance payments.

Overall, the relevant law in the comparative jurisdictions evidences a lack of appreciation for the locational and regulatory characteristics. This needs to change: the technical and commercial developments taking place in the industry will increase the palatability to lenders of, and demand from borrowers for, asset-based satellite financing. These lenders and borrowers will ask more of, and expect more from, the legal systems in which they operate. And they will be prepared to move around to find appropriate systems. Accordingly, jurisdictions that wish to support their satellite industry should review their legal infrastructure in light of the locational and regulatory characteristics.

I have raised many areas for potential reform in this article, and identified particular instances of best practice. For example, Hong Kong’s express requirement to seek regulatory consent before granting a satellite security interest resolves ambiguity

¹⁹⁰ Richard D Cunningham, “Space Commerce and Secured Financing - New Frontiers for the U.C.C.” (1985) 40:3 *Business Lawyer* 803 at 827.

¹⁹¹ *Ibid* at 803.

¹⁹² D’Angelo, *Aerospace Business Law*, *supra* note 5 at 105.

¹⁹³ Tey, *Personal Property Law*, *supra* note 83 at 1602. In the English context, McKendrick simply comments that the “rules of English law as to perfection and priorities are seriously defective”: McKendrick & Goode, *Commercial Law*, *supra* note 55 at 784. The same could be said of the Singapore and Hong Kong regimes.

¹⁹⁴ Neo, “Secured Transactions Law in Singapore”, *supra* note 17.

around attachment. It should be more broadly adopted. But is local and piecemeal reform of these regimes the best way forward? In my view, no. Instead, I suggest the inherently cross-border nature of the Asia-Pacific satellite industry means that bolder—and international—reform is more likely to promote asset-based satellite financing on a regional basis. Simply put, lawmakers will need to think broadly and laterally to deal with the needs of an increasingly commercialised space environment.

Fortunately, they will not be starting from scratch. Indeed, there is a clearly laid path for this reform: implementation of the *Space Protocol*. It is high time to revisit the currently dormant *Space Protocol*. This instrument includes sufficient flexibility to accommodate the presently predominant project finance structures and the asset-based satellite financings of the future. As I have raised throughout this article, the *Space Protocol* is particularly successful in addressing the adverse impacts of the locational characteristic by providing for an international interest recorded in an international register. It is by no means a perfect instrument (if such a thing exists). It largely fails to resolve issues arising from the regulatory characteristic. And the *Cape Town Convention* system's elaborate set of declarations, as well as its reliance on domestic courts, may result in its "renationalization".¹⁹⁵ Equally important (at least to commercial parties) is the apparent impossibility of registering an international instrument arising from a floating charge¹⁹⁶ under the *Space Protocol*. The rise of so-called 'megaconstellations'¹⁹⁷ may make such a floating security device attractive to financiers.¹⁹⁸

While these issues deserve further attention, importantly, they do not appear to be intractable.¹⁹⁹ And ultimately, as Sundahl summarises, "[t]he weight of experience and economic theory indicates that a harmonised, transparent and creditor-friendly law of secured transactions will facilitate the financing of space ventures."²⁰⁰ This is borne out by the success of the *Aircraft Protocol*, which has accelerated the growth of the Asia-Pacific aircraft leasing industry and supported the development of regional aviation.²⁰¹ A similar result for satellites would deliver greater legal certainty for lenders and provide more financing options for borrowers. The region would stand to benefit from greater access to space-based services, such as high-speed internet. To this end, and in the specific Asia-Pacific context, the *Space Protocol* could provide the cross-border legal infrastructure necessary for the region to excel in the NewSpace era.

¹⁹⁵ Havel & Mulligan, "Renationalization of Cape Town Convention", *supra* note 71.

¹⁹⁶ Saidova, *Security Interests*, *supra* note 16 at 72. See also Havel & Mulligan, "Renationalization of Cape Town Convention", *ibid* at 150.

¹⁹⁷ Constellations comprising hundreds or thousands of small satellites, typically operating in low Earth orbit.

¹⁹⁸ This is because satellites in megaconstellations will frequently be replaced as they either de-orbit or malfunction, making the satellites potentially more akin to revolving inventory than high-value assets.

¹⁹⁹ Indeed, the *Space Protocol* may motivate States to revisit their space-related regulatory regimes; investor-State dispute settlement may provide a solution to the "renationalization" problem (Havel & Mulligan, "Renationalization of Cape Town Convention", *supra* note 71 at 91); and the registration of floating interests issue could be addressed in the regulations that will be needed to implement a space assets register (Saidova, *Security Interests*, *supra* note 16 at 150 and text to n 66).

²⁰⁰ Sundahl, *Cape Town Convention Application*, *supra* note 6 at 28.

²⁰¹ World Leasing Yearbook, Robert F Agnew, *The Birth and Growth of the Aircraft Leasing Business*, online: World Leasing Yearbook <<https://www.world-leasing-yearbook.com/feature/the-birth-and-growth-of-the-aircraft-leasing-business/>>.