



The 'Space' for Regulation within Outer Space

Space is a border that all nations share, and was a boundary only accessible to a few select nation states. In the 21st century the technological landscape has shifted dramatically, and now not only nation states, but private corporations can cross into this boundless domain. Kick-started by the space race of the 1960s, the invention and development of satellites has allowed for the digitalisation of human life; the function of our phones, laptops and critical every day services of our infrastructure are only possible because of satellites in Low Earth Orbit (LEO). However, the competition for space power in a new, commercial arena has created significant risk that is not yet being universally regulated. This discussion provides an overview of the exponential growth in the number of objects in LEO, for which existing space law remains inadequate and highlights the regulatory gap between 1967 and 2021. Current space law fails to mitigate the increased global risk of traffic and space debris that could cost humanity access to space altogether. There is no presence of detailed and agreed upon rules of the road or space navigation rights, responsibilities and procedure. This discussion, referencing the current NZ legislation, will suggest a way forward for the use of space which is universally regulated and balances reasonable commercial economic interests with sustainable management of orbital debris.

1. The inadequacy of existing space law


The radically transforming technologies in LOE are challenging regulators who are faced with old law in completely different regulatory landscape. Space law operates on the international law principle “res communis”; a territory that is not subject to legal title of any state.¹ Outer space is the province of humankind, it cannot be appropriated and may be used by all countries. These principles were set out in the 1963 Space Declaration² and repeated in the 1967 Outer Space Treaty³ (OST) that have acted as the basic legal framework for regulating outer space and is binding for all states.⁴ This multilateral agreement was initially

¹ Res Communis, In *Encyclopaedic Dictionary of International Law*, retrieved from <https://www.oxfordreference.com/view/10.1093/oi/authority>

² United Nations Office for Outer Space Affairs (UNOOS), *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, 13 December 1963

³ UNOOS, *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, 1967

⁴ Katrin Nyman Metcalf, *A legal view on Outer Space and Cyberspace: Similarities and Differences* (2018) Tallin Paper 10



signed and ratified by the United States, the United Kingdom and the Soviet Union as the Cold War expanded into space. These global superpowers battled for supremacy in space, transforming it into an arena of political contestation that needed to be met by laws. The Treaty aimed to reaffirm the importance of international cooperation in peaceful exploration of outer space and the importance of developing the rule of law in this new area of human endeavour.⁵ The OST makes it clear that international responsibility rests with states for their national activities (Article VI)⁶ and places international liability on the launching state for damage to another state party (Article VII).⁷ Yet, these international law principles are being tested as emerging technology from new private entities has advanced a second space race, this time between companies, rather than nations. At the core of this discussion is the technological innovation in LEO, in which existing law fails to capture an entirely new landscape of the privatisation of space activities. This presents what Dr. Nick Bostrom terms an ‘endurable risk’ to humankind: the risk ‘may cause great destruction, but one can either recover from the damage or find ways of coping with the fallout’.⁸

2. Satellites in low Earth orbit

LEO is a zone that is around 100,000km above earth and it is where the majority of Earth’s satellites reside.⁹ With over of half of satellites being commercial, LEO is filling up fast.¹³ The Online Index of Objects Launched into Outer Space reveals 11,690 objects have been deployed, dating back to Sputnik 1, the first satellite launched by the USSR in 1957. But in 2020 and 2021 alone, 2,658 objects have been sent into space, representing 22% of all objects of all objects deployed from Earth since 1957.¹⁴

⁵ Convention on Registration of Objects Launched into Outer Space, *2280th plenary meeting*, 12 November 1974.

⁶ Outer Space Treaty 1967, Article VI

⁷ Outer Space Treaty 1967, Article VII

⁸ Dr. Nick Bostrom, *Existential Risks: Analyzing Human Extinction Scenarios and Related Hazards* (2002) 9 JET 1

⁹ Jonathan McDowell, The Low Earth Orbit Satellite Population and Impacts of the SpaceX Starlink Constellation, 2020, *ApJL* **892** L36, 1-10

¹³ At 2

¹⁴ Online Index of Objects Launched into Outer Space (29/08/21) United Nations Office for Outer Space Affairs < <https://www.unoosa.org/oosa/osoindex/search-ng.jsp> >

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Companies are projecting satellites into orbit at an unprecedented frequency, with the aim of building ‘mega-constellations’ of communications satellites in LEO.¹⁵ In what has been dubbed the ‘billionaire space race’, Elon Musk’s company SpaceX is on track to add 12,000 more satellites to the already existing 6,000, sending up 60 satellites per month, as it builds Starlink’s mega-constellation.¹⁶ SpaceX has filed for permission for a further 30,000 satellites with national space regulators, FCC.¹⁷ The aim is to create an instantaneous, high speed internet system to meet consumers’ needs across the globe, and this is not without competition.¹⁸ Amazon’s Blue Origin has been approved to launch over 3,000 satellites, and other companies including OneWeb, Telesat, and Chinese state-owned GW are all similarly competing for space power.¹⁹ This provides a stark contrast to the arena in which two key players, the USSR and the USA, once dominated. Alarming, as private companies develop new activities, space debris is emerging as a real practical problem. With no legal regime to hold both commercial and nation state parties accountable, these private enterprises, driven by profit, will continue to pollute and leave debris in Earth’s orbit free of accountability and regulation.²⁰

3. Framing the Problem

As the number of artificial satellites in earth orbit increases, so does the probability of collisions between satellites. The risk of collision is far greater than just two satellites colliding and private companies taking a hit on their bottom line. These objects are flying above earth at 28,000km an hour, 8km a second – orbiting earth 12 times a day.²² The Kessler Syndrome, proposed by NASA scientist Donald Kessler, is the theoretical scenario that hypothesises space debris of critical mass will fragment in further collisions leading to a cascading chain reaction, eventually making space impenetrable from earth.²³ This scenario

¹⁵ Aaron Boley & Michael Byers, Satellite mega-constellations create risks in Low Earth Orbit, the atmosphere and on Earth, *Scientific Reports* 11, 10642 (2021).

¹⁶ McDowell 2020, “The Low Earth Orbit Satellite Population and Impacts of the SpaceX Starlink Constellation”, above n 11, at 1

¹⁷ At 2

¹⁸ At 1

¹⁹ A Venkatesan, J. Lowenthal, P Prem, *et al.* The impact of satellite constellations on space as an ancestral global commons. *Nat Astron* 4, 1043–1048 (2020)

²⁰ Chelsea Muox-Patchen (2018), Rugulating the Space Commons: Treating Space Debris as Abandoned Property in Violation of the Outer Space Treaty, *Chicago Journal of International Law*, Vol. 19: No:1, Article 7 250

²² Donald J Kessler and G Burton. (1978). "Collision Frequency of Artificial Satellites: The Creation of a Debris Belt". *Journal of Geophysical Research*. 83 (A6): 2637–2646

²³ Above at 2639

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highlights the potential catastrophic consequences to our space infrastructure if proper care is not taken.

These fears are by no means unfounded. In 2009, an inactive Russian communications satellite Cosmos 2251 collided with an active US-based commercial communications satellite, Iridium Satellite LLC.²⁴ The shrapnel collision completely destroyed both satellites, producing over 2,000 pieces of debris, measuring at least ten centimetres in diameter and many more thousand smaller pieces.²⁵ While some pieces have decayed into the atmosphere, it is estimated that most of the debris will remain in orbit for decades longer.²⁶ In an instant two objects became thousands, exponentially increasing ongoing debris collisions. This collision is illustrative of the risk vast technological developments present, working within an outdated legal landscape and voluntary regulatory regimes.

The applicable international law stemmed from both the 1967 Outer Space Treaty and the 1972 Liability Convention, both of which attempted to impose liability on the “launching state”.²⁷ Evidently, the Russian Federation was responsible for launching Cosmos 2251, yet Iridium Satellite LLC invoked complexities in determining liability for fault, as the U.S, Russia and Kazakhstan were all parties to the launch.²⁸ Legal sanction was made more difficult as the satellite was not registered with the United Nations, as required by the 1975 Registration Convention.²⁹ The issues of the case highlight fundamental regulatory uncertainty which all users of space currently face.

The failure of the U.S to register the satellite was a violation of its international obligation under the Registration Convention, and raises concerns that major space-faring nations are not faithfully observing binding obligations they have voluntarily assumed.³⁰ More poignantly, registration with the UN remains voluntary for states altogether, while private companies are not entitled to directly register their space object with the UN Secretary-

²⁴ Brian Weeden, 2009 Iridium-Cosmos Collision Fact Sheet (10/11/2010) Secure World Foundation www.swfound.org 1-3, at 2

²⁵ Above n 25, at 2

²⁶ Above n 25, at 2

²⁷ Ram Jakhu, “*Iridium-Cosmos collision and its implications for space operations*”, McGill University, 2010 254-275

²⁸ At 260

²⁹ Convention on Registration of Objects Launched into Outer Space 1976. Article IV(1)

³⁰ Above n 28, at 259

General.³¹ This illustrates a regulatory gap in which a mandatory registration system would strategically mitigate the risk of traffic and achieve maximum transparency in space activities, more faithfully securing the objective of the Regulatory Convention. Secondly, the routine abandonment of dead satellites - of which there are 3000 - has arguably created a new customary rule, that alters the bone fide position of Article IX in the Outer Space Treaty, that specifies states must have due regard to corresponding interests of all other states.³² While there has been an increase in national regulations that require space operators to de-orbit satellites once expired, there remains no international standard to enforce mitigating the risk imposed by derelict spacecrafts.³³ Moreover, permitting states to leave inactive satellites in orbit disregards the real risk of space debris, while the regulatory authority remains non-binding principles and guidelines from independent organisations. Thus, the Iridium-Cosmos collision signifies the urgent need of rules, procedures, resources and a neutral international body to determine liability and enforce binding regulations in regard to space traffic and debris.³⁴

4. Industry Awareness and Current Strategies

Since the Iridium-Cosmos collision, extensive awareness has been raised around satellite collisions and the detrimental effects space debris will continue to have on earth. As noted above, there are a number of non-binding industry principles that act to aid regulators on a national level. The U.S Space Policy Directive-3 (SPD, “National Space Traffic Management Policy”) recognises the growing threat to space activities from orbital debris.³⁵ It directs NASA, in combination with various public state actors to lead efforts to update the U.S Government Orbital Debris Mitigation Practices (ODMPS) and establish new guidelines for satellite design and operation.³⁶ However, NASA’s focus is ‘full speed ahead’, having recently opened the International Space Station for commercial business, so that U.S. industry innovation and ingenuity “can accelerate a thriving commercial economy in low-

³¹ Ram S. Jakhu, Bhupendra Jasani, Jonathan C. McDowell, 2018, Critical issues related to registration of space objects and transparency of space activities, *Acta Astronautica* 143 408

³² Above n 28, at 256

³³ At 556

³⁴ At 556

³⁵ Federal Communications Commission, *Mitigation of Orbital Debris in the New Space Age* (2020) 85 FR 52422-524541, at 52422

³⁶ At 52422

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Earth orbit.”³⁷ It seems NASA’s plan to quantify “long-term demand for activities in low-Earth orbit”³⁸ paradoxically undermines any recognition to regulate increased risk of space debris associated with the commercialisation of space. In addition the ODMPs has limited effect, only applying to missions operated by U.S. government agencies, while providing mere reference to promote efficient space safety practises for other domestic operators.³⁹ The SPD-3 policy recommended that the U.S should eventually incorporate appropriate standards into federal law,⁴⁰ yet for now space is led by industry self-regulation. While companies like SpaceX are taking some precautions, their motive for expanding space is inherent in financial gain and satisfying investors within these commercial enterprises. This marks a concerning departure from space as common heritage of humankind, as it is rapidly recast into a private good, open for business.⁴¹

Additionally, there are international standards-setting organizations, such as the Inter-Agency Space Debris Coordination Committee (**IADC**). IADC is an international forum of government bodies “for the coordination of activities related to the issues of man-made and natural debris in space”⁴², yet the vocalisation of these standards are yet to hit their mark. IADC recent “Statement on Large Constellations of Satellites in Low Earth Orbit”, suggest acute acknowledgement of the problem, but seems to be reminiscent of corporate virtue signalling. It recognises the increased number of constellation architectures in development, yet the approach merely offers “preliminary qualitative observations that operators could consider in their conceptual design”.⁴³ While IADC has positively contributed the only remedial scheme for space debris, it is an independent organisation that lacks any legal authority to monitor and strengthen international guidelines as debris continues to accumulate.⁴⁴ This exemplifies a greater institutional problem, in which organisations are working to signal risk, yet the traditional mechanisms of rule and order, cannot keep up. Moreover, the guidelines only propose the reduction of new debris and do not resolve the

³⁷ NASA, *NASA Opens International Space Station to New Commercial Opportunities, Private Astronauts* (press release, Jun 8, 2019)

³⁸ Above n 38

³⁹ Above n 36 at 52426

⁴⁰ Above n 26 at 52426

⁴¹ Victir Shammas & Tomas Holen, “One giant leap for capitalistkind: private enterprises in outer space. *Palgrave Commun* 5, 10 (2019)

⁴² Inter-Agency Space Debris Coordination Committee Website, Retrived from https://www.iadc-home.org/what_iadc (8/9/21)

⁴³ IADC *Statement on Large Constellations of Satellites in Low Earth Orbit*, September 2017

⁴⁴ Paul B. Larsen, *Solving the Space Debris Crisis*, 83 *J. Air L. & Com.* 475 (2018)

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existing debris problem, which continues to increase. It illustrates there is a way forward, but with enforcement only applying to those who optionally sign up, and with no consequence or penalties, there are no traditional legal mechanisms to implement binding preventative action.

Work by IDAC did help to inform the development of the Space Debris Mitigation Guidelines of the United Nations (UN) Committee on the Peaceful Uses of Outer Space. However, as with IADC Guidelines, the UN Guidelines only establish voluntary, non-binding consensus principles for space debris mitigation, that can only be enforced through domestic legislation or regulatory mechanisms. Scholar, Ram Jakhu argues “the guidelines are one of the lowest forms of any statement on a highly serious space-related international concern by a UN body”.⁴⁵ It appears that for now we languish in the hover-sphere of impotent good intent, while domestic commercial interests in space may run rampant.

The closest the OST comes to addressing the issue of space debris is in Article IX that asserts: “states shall pursue activities of outer space in a manner that avoids any harmful contamination or adverse environmental changes on Earth”.⁴⁶ Yet, the use of ‘harmful’ and ‘adverse change’ underscores the lack of specificity over what exactly constitutes environmental damage, or what agencies must refrain from harming.⁴⁷ Moreover, as the OST emerged as a product of the nuclear age, the discourse is directed towards chemical effluent pollution, that does not capture the necessary obligation to remove or prevent space debris, again highlighting the regulatory gap between outdated legislation and reality.⁴⁸ Some scholars have argued that space debris can be interpreted into the OST through a broadened interpretation of “space objects”, as being the responsibility of the launching state.⁴⁹ These arguments fail to acknowledge the OST as a product of its time, in which space debris could not have been within the drafter’s intention at the dawn of the space age. Moreover, the OST is explicit in prohibiting nation states appropriating outer space, that fundamentally leaves direction for private companies wide open.


⁴⁵ Ram Jakhu, “Iridium-Cosmos collision and its implications for space operations” above n 28, at 266

⁴⁶ Outer Space Treaty 1967, Article IX

⁴⁷ Gupta, V. (2016) ‘Critique of the International Law on Protection of the Outer Space Environment’, in *Astropolitics* (Vol. 14, No: 1, 20-43, at 27

⁴⁸ At 27

⁴⁹ Chelsea Muox-Patchen (2018) “Regulating the Space Commons: Treating Space Debris as Abandoned Property in Violation of the Outer Space Treaty”, *Chicago Journal of International Law*, Vol. 19 Article 7, 233-59, at 246



Scholar Chelsea Munoz-Patchen suggests the internationally-accepted definition of space debris as non-functional, no longer useful, manmade objects, can be applied to the common law doctrine of abandonment.⁵⁰ This strategy advocates for space debris to be recognised as abandoned property, and as such would not be subject to the property rights of the original launching state and would be free to be disposed of by other parties.⁵¹ The aim of her discussion is to develop a definition of space debris to include non-functional objects like non-operational satellites, that allows other space faring nations to remove them without a formal transfer of ownership. This presents a strategy to avoid the risk of collisions like Iridium-Cosmos. However, it places responsibility on spacefaring nations to clean up other parties' debris, whereupon there is no incentive in law (or in noting the inherent nature of national self-interest), to invent and deploy clean-up technology required to do so or place a greater emphasis on debris mitigation. Global problems need global solutions, that should not fall upon the shoulders of responsible nations, but instead be effectively implemented through internationally binding regulations.


5. International Solutions

This discussion illustrates the significant challenges regulators in face given there is no unitary mechanism to enforce the rules required to protect space as a global common. Scholars such as Jakhu urge the international community to continue “searching for a means for strengthen international guidelines and to coordinate national space debris mitigation efforts”.⁵² The international arena have been put on notice, through theories like the Kessler Syndrome and independent organisations like IADC that recommend technical standards to be followed. However, space seems to be a challenge in and of itself as the expansive borderlessness allows the shared space to be acquired by any wealthy agent who has the means. Thus, should the United Nations Committee on the Peaceful Uses of Outer Space (COPIOUS), as the current international advisors, develop a binding regulatory regime to be followed unilaterally by all space operators, there is no guarantee it will fix the problem. This discussion argues international law must be implemented, yet acknowledges the challenges are broader than the law itself. There is an inherent relationship between international space law and power politics, underlined by the growing tensions between the worlds global

⁵⁰ At 246

⁵¹ At 246.

⁵² Ram Jakhu, “Iridium-Cosmos collision and its implications for space operations”, above n 28, at 266



superpowers in the race to commercialise space. As such, the development of space law has stalled, while domestic space law development is at the forefront. While the rising tension in space calls for even greater concern for international oversight, perhaps domestic legislation can be used as a strategy to find order among the chaos of space.

6. New Zealand's Implementation of The Outer Space Act 2017

New Zealand's newly-established space policy regime has allowed our small Pacific nation to become one of the fastest-growing space economies in the world.⁵³ As American aerospace manufacturer Rocket Lab established on New Zealand soil, New Zealand went from having no national space law to enacting The Outer Space and High-Altitude Activities Act 2017.⁵⁴ The Act governs the launch of space objects such as rockets and satellites into outer space from New Zealand (and by New Zealanders overseas) and regulates launch facilities.⁵⁵ It is an example of our government working to meet New Zealand's international obligations associated with space activities, while balancing important participation in economic development to the benefit of all New Zealanders. In the 1960s and 70s, New Zealand ratified both the OST and Liability Convention.⁵⁶ Yet fifty years later, New Zealand acknowledged Rocket Lab's activities provided "a graphic illustration of how developments in technology have changed the space industry and made it accessible to a wider group of participants".⁵⁷ In the article, *Managing the Opportunities and Risks Associated with Disruptive Technologies space law in New Zealand*, the authors acknowledged this "necessitated a change of view on the need for legislation to implement the rights and obligations of the space treaties" and "led us to consider how to ensure that legislation would provide a balance between risk management and not inhibiting economic development and innovation".⁵⁸ Notable to this discussion was the consideration to address the long-term sustainability of the space environment and the management of orbital debris that "needed to be factored into New Zealand's regulatory regime".⁵⁹ This illustrates an effective strategy at the national level that works towards the regulation and mitigation of a global problem.

⁵³ Simon Martin and Josie Desmon, The Space Law Review: New Zealand, *Hudson Gavin Martin*, 17 December 2020

⁵⁴ The Outer Space and High-Altitude Activities Act 2017


⁵⁵ Kirsty Hutchinson, Katherine MacNeil, Peter Mumford and Val Sim (2017), *Managing the Opportunities and Risks Associated with Disruptive Technologies space law in New Zealand*, *Policy Quarterly – Vol 13, 4* – 28-35 at 29

⁵⁶ At 29

⁵⁷ At 29

⁵⁸ At 29

⁵⁹ At 30



The regulatory approach is also a relevant consideration, as New Zealand acknowledged the risk of emerging technology surpassing embedded law, as seen with the OST. The balance required to address the risk of law becoming obsolete is evident in New Zealand adopting a performance-based approach, over a perspective approach. The prescriptive approach works to provide short-term requirements for space industry participants to meet.⁶⁰ However, there is a real risk that including detailed requirements in primary legislation limits the ability of the law to adapt to rapidly-evolving space technologies and new markets.⁶¹ Actively recognising this, New Zealand instead adopted a performance based approach to focus on setting intended outcomes that must be achieved, rather than prescribing detailed processes and procedures to be followed.⁶² A performance-based approach “allows the regulator’s decisions to be tailored to particular cases. It is therefore more amendable to changes in technology, risks and market conditions.”⁶³ New Zealand also embedded the key principles of responsibility, sustainability and safety to guide our regulatory framework, promoting an orbital environment that avoids interference with others and preserves the benefits of space for future generations.⁶⁴

New Zealand is providing a potentially profitable exemplar in space law development, establishing our position as a country that wants to participate in the space race, yet acknowledges the harmful risk to the environment. Governments in a global commons must strike this balance, in which an international governing body would help to implement these standards. New Zealand has shown how it can be done, providing precedent for other international players to catch up and keep up.

7. Conclusion

This essay has pointed to the failure of the UN OST to adequately regulate private space enterprises in outer space. Predominately designed from a state-centric perspective, the increasing entanglement of the state apparatus with the private sector is enabling both actors to satisfy their rampant extra-terrestrial interests through legal ambiguities in a way that the treaty never envisaged possible. This has presented an enduring risk to human kind, as


⁶⁰ At 31

⁶¹ At 31

⁶² At 32

⁶³ At 32


⁶⁴ Simon Martin and Josie Desmon, *The Space Law Review: New Zealand*, 2020, above n 52



Kessler's possible prediction of a tragedy of the commons becomes increasingly real. This discussion suggests there is an urgent need for a more comprehensive and detailed regulatory framework to govern and enforce international standards in space. As a complex task, New Zealand's national framework presents strategies are possible and may provide the template for the development of a global framework in performance and implementation.

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