Space Weapons and the Increasing Militarisation of Outer Space: Whether the legal framework is fit-for-purpose

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Space weapons are the logical progression in the increasing militarisation of outer space. As the landscape of space exploration adapts to the new space economy, both outer space and space weapons are more readily available to a broader range of actors. Space wars are an increasing possibility with which international law must grapple. This article explores whether the legal framework is fit-for-purpose in addressing the potential weaponisation of outer space by reconciling the relevant space law and disarmament principles, including international humanitarian law. The analysis ultimately highlights that cumulatively applying different laws to the new space economy produces lacunae in the regulatory regime. As a result, current international law is unable to prevent the weaponisation of outer space. The most critical gap concerns the testing of debris-causing space weapons. The article then considers the New Zealand (Aotearoa) context, using Rocket Lab as a case study for the role of domestic space law in the new space economy. Domestic space legislation fills some of the gaps in the legal framework. However, Aotearoa's flexible approach to risk management leaves the issue of space weapons to Cabinet guidelines, which lack sufficient legal force. Moreover, Aotearoa's space activities include satellite launches for foreign militaries, which exacerbate the conditions for the eventual weaponisation of outer space. Satellites improve national security by employing offensive or defensive military capabilities, yet states cannot determine their genuine intent, partly due to the enmeshment of military and commercial activities. The uncertainty of intent incentivises space actors to protect their assets by developing and using space weapons. Thus, the law must evolve to address space weaponry proactively in times of peace before conflict spreads to outer space.

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I INTRODUCTION

The 1957 launch of the Sputnik I satellite by the Soviet Union did not just push the frontiers of science, but of law. The launch revealed the possibilities and dangers of a militarised outer space and birthed international space law.[1] "Militarisation" is a passive concept that implies a military presence in outer space. Space has become increasingly militarised since the dawn of space exploration; an estimated 75 per cent of satellites perform military functions.[2] Importantly, militarisation and weaponisation are not interchangeable terms. Weaponisation includes placing weapons in outer space, for example anti-satellite weapons (ASAT); however, the parameters of the definition of weaponisation in relation to space is fraught with controversy.[3] Despite extensive militarisation, space is not yet weaponised.[4]

The legality of space militarisation has two aspects: the stationing of military equipment in outer space; and the rise of "dual-use" systems and technology. The latter refers to the majority of space assets, which are capable of both civil and military use.[5] In particular, commercial satellite systems may be used by states to support military operations when the need arises.[6] Consequently, states cannot always determine whether a satellite is a military threat.[7] The logical progression in the militarisation of space is, therefore, the development and future use of space weapons.[8] ASAT technology owned by major space-faring nations (space powers) substantiates this concern: China (2007), the United States (2008), Russia (2018 and 2020) and India (2019) have all tested ASATs.[9]

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1 Tanja Masson-Zwaan and Mahulena Hofmann *Introduction to Space Law* (4th ed, Wolters Kluwer, The Netherlands, 2019) at 65; and Francis Lyall and Paul Larsen *Space Law: A treatise* (Ashgate, Surrey, 2009) at 507.

2 Emily Taft "Outer Space: The Final Frontier or the Final Battlefield" (2017) 15 Duke L & Tech Rev 362 at 370.

3 Columba Peoples "The Securitization of Outer Space: Challenges for Arms Control" (2011) 32(1) Contemporary Security Policy 76 at 78.

4 Karl Hebert "Regulation of Space Weapons: Ensuring Stability and Continued Use of Outer Space" (2014) 12(1) Astropolitics 1 at 7. However, this long-standing belief may be outdated given recent speculation around activity of the United States and Russia.

5 Lyall and Larsen, above n 1, at 500.

6 Aleksander Lubojemski "Satellites and the Security Dilemma" (2019) 17(2) Astropolitics 127 at 128-129.

7 At 134.

8 At 135.

9 At 137; Kelsey Davenport "Indian ASAT Test Raises Space Risks" *Arms Control Today* (online ed, Washington, May 2019); and Stephen Clark "U.S. officials say Russia tested a new anti-satellite weapon" *Spaceflight Now* (online ed, United Kingdom, 23 July 2020).

Nevertheless, prohibiting all military activity is not feasible. It would restrict the ability to use space at all, including for peaceful purposes, since all space exploration relies on military technology and intelligence.[10] Military and non-military use of outer space is too indistinguishable for complete demilitarisation.[11] The primary issue is the extent to which the law should allow states to militarise space and whether this should include its weaponisation.[12]

Space weapons inevitably create space debris which threatens the continued use of outer space, including for peaceful purposes. This is because there are no reliable or proven methods for clearing it.[13] Statistics on the likelihood of a catastrophic collision for a given period only account for the natural usage of space and not the effect of debris-causing space weapons. The Chinese ASAT test illustrates the impact space weapons have on the hypothesis. This single test increased low Earth orbit (LEO) debris by 20 per cent, which increased predicted collisions by 37 per cent.[14]

Aotearoa's experience illustrates how the changing landscape has propelled new actors into space. Aotearoa, the fourth-largest Launching State,[15] did not aspire to become a space-faring nation. Indeed, many could not have thought it was possible.[16] Nevertheless, Aotearoa contributes to the increasing militarisation of outer space by launching military satellites for foreign governments, particularly the United States.[17]

This article explores whether the current legal framework is fit-for-purpose in preventing the weaponisation of outer space. The article begins in Part II by traversing the key terms "space debris" and "space weapon" and, in Part III, the treaties and customary international law (CIL) that comprise current international space law. Then, after outlining international humanitarian law (IHL) and the key

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10 Taft, above n 2, at 371.

11 At 372.

12 At 370.

13 Promit Chatterjee "Legality of Anti-Satellites Under the Space Law Regime" (2014) 12(1) Astropolitics 27 at 39; and Hebert, above n 4, at 14.

14 Hebert, above n 4, at 13.

15 Eleanor Ainge Roy "Aiming for the stars: how New Zealand's space industry is causing turbulence" *The Guardian* (online ed, New Zealand, 24 January 2020).

16 Steven Freeland, Kirsty Hutchison and Val Sim "How Technology Drives Space Law Down Under: The Australian and New Zealand Experience" (2018) 43(2) Air and Space Law 129 at 140.

17 The Ministry of Business, Innovation & Employment [MBIE] "Payloads Approved for Launch" <www.mbie.govt.nz>. New Zealand has launched objects for the United States military, including the following entities: National Reconnaissance Office, United States Air Force Space Command, United States Special Operations Command, United States Defense Advanced Research Projects Agency, United States Naval Academy and United States Air Force Research Laboratory.

disarmament treaties relevant to the militarisation of space in Part IV, Part V considers the changing international landscape. Stage-set, Part VI then assesses whether international law can prevent outer space's potential weaponisation during peacetime and wartime. The analysis identifies the lawful and unlawful military uses of space and highlights gaps in the law. The article concludes in Part VII by considering implications for Aotearoa's space activities under its domestic space law.

II SPACE DEBRIS AND SPACE WEAPONS

No official definitions exist for "space weapon" or "space debris".[18] Dual-use technology complicates the task of defining "space weapon". Dual-use systems can contribute to all humankind's common interest but can also promote hostile purposes.[19] Without agreed definitions for "space weapon" and "space debris", meaningful progress in regulating them is dubious.[20] Karl Hebert defined "space weapons" as:[21]

> ... any asset, Earth-based or space-based, designed to attack targets in space (Earth-to-space and space-to-space). Space weapons also include space-based assets designed to attack targets on Earth... space-based weapons include weapons placed on celestial bodies.

Earth-to-Earth-via-space is another category of weapon, which includes intercontinental ballistic missiles (ICBMs). Thus, four types of weaponisation and warfare exist: Earth-to-space, space-to-space, space-to-Earth and Earth-to-Earth-via-space.[22] Among these categories are weapons that disintegrate their target — for example, kinetic energy (KE) weapons — as well as those which degrade or disable satellites rendering them useless. The latter include directed energy (DE) weapons that use lasers, radiofrequency and particle beams to disable satellites. Both KE and DE weapons result in space debris.[23]

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18 Hebert, above n 4, at 4 and 12.

19 Jinyuan Su "Space Arms Control: Lex Lata and Currently Active Proposals" (2017) 7(1) AsianJIL 61 at 84.

20 Lubojemski, above n 6, at 135.

21 Hebert, above n 4, at 3.

22 At 3.

23 At 3.

This article describes space debris as manufactured objects orbiting the Earth, which are useless and inactive. Space debris includes, inter alia, fragments from ASAT tests and defunct satellites; it is indiscriminate and risks damage to satellites.[24]

III SPACE LAW

Space law is not a separate body of law; it includes all law, domestic and international, applying to outer space itself and to activities in or related to outer space.[25] Technological advancements drive the need for rapid international law developments, making treaties the chief source of space law.[26] With the rise of commercial space actors, domestic laws implementing international obligations increasingly govern space activities.[27]

Customary International Law (CIL)

The essence of CIL[28] is that it constitutes evidence of a general practice accepted as law.[29] CIL has two requirements: first, a general practice, as evidenced by states' actual behaviour;[30] and second, acceptance of the general practice as law, such that it invokes a sense of legal obligation or opinio juris.[31] Peremptory norms are a subset of CIL,[32] forming exceptions to positivist treaty law.[33] Both new and existing peremptory norms render conflicting treaties void.[34]

CIL binds all states except those opposing a rule from its inception.[35] Space powers must accept and recognise CIL for it to become law, irrespective of other states' inclinations. As such, the

24 At 12.

25 Lyall and Larsen, above n 1, at 2.

26 Malcolm Shaw *International Law* (9th ed, Cambridge University Press, Cambridge, 2021) at 70.

27 Masson-Zwaan and Hofmann, above n 1, at 15.

28 CIL exists and applies separately to treaty law, even where the content is identical. Treaties and CIL can supersede each other or co-exist as the two most influential sources of international law. For more on the sources of international law and their interrelationship, see Shaw, above n 26; and Jan Klabbers *International Law* (2nd ed, Cambridge University Press, Cambridge, 2017).

29 Statute of the International Court of Justice, art 38(1).

30 Shaw, above n 26, at 55.

31 Klabbers, above n 28, at 26.

32 Vienna Convention on the Law of Treaties 1155 UNTS 331 (opened for signature 23 May 1969, entered into force 27 January 1980) [VCLT], art 53."Peremptory norm" is defined under art 53.

33 Klabbers, above n 28, at 23; and Shaw, above n 26, at 704.

34 VCLT, above n 32, arts 53 and 64.

35 Klabbers, above n 28, 67-68.

United States and Russia are influential in space law.[36] The difficulties in establishing new CIL mean that it is not the best tool for regulating complex issues.[37] Codifying aspects of CIL in multilateral treaties is preferable as it creates certainty.[38]

The Charter

The Charter of the United Nations (Charter)[39] provisions on maintaining peace and security provide the overarching context of space law.[40] The Charter creates a presumption against the use of force,[41] which is a peremptory norm.[42] Necessarily, it is illegal to threaten to use force in a situation where the use of force itself is unjustifiable or unlawful.[43]

Notable exceptions to this general prohibition exist for actions mandated by the United Nations Security Council (UNSC) and the right to self-defence,[44] which govern space weapons.[45] The UNSC determines the existence of any threat to the peace, breach of the peace or act of aggression and makes recommendations to intercede by either non-military[46] or military[47] measures.[48] Member states are then bound to carry out the measures decided by the UNSC.[49]

1 Self-defence

Two sets of rules govern the legality of wartime actions by states: the law governing the right to wage war; and the law of war (that is, IHL). IHL regulates hostile conduct to limit the means and methods of warfare employed and target selection.[50] The Charter outlines the right

36 Shaw, above n 26, at 59.

37 At 54.

38 Kim Murray "Rule Making and the Implementation of International Law Standards" (paper presented to the Lexis Nexis Conference on Legal Issues for Crown Entities, Wellington, September 2009) at [10].

39 Charter of the United Nations 1 UNTS XVI (opened for signature 26 June 1945, entered into force 24 October 1945) [Charter].

40 Article 1(1); Lyall and Larsen, above n 1, at 503.

41 Articles 2(3) and 2(4).

42 *Report of the International Law Commission* UN Doc A/74/10 (29 April–7 June and 8 July–9 August 2019) at 147.

43 Rik Hansen "The Role of the Air-Space Boundary in Regulating Military Use of Outer Space" (2015) 40 Ann Air & Space L 25 at 31; and Shaw, above n 26, at 856.

44 Shaw, above n 26, at 857.

45 Hansen, above n 43, at 48 and 51-52.

46 Charter, above n 39, art 41.

47 Article 42.

48 Article 39.

49 Hansen, above n 43, at 32.

50 At 30-35.

to wage war under prescribed circumstances and takes precedence over IHL logically and temporally.[51]

Exercising the inherent right of self-defence engages the right to wage war. Self-defence is a CIL right, not requiring prior UNSC approval.[52] However, the right is limited, existing only until the UNSC takes measures necessary to maintain international peace and security.[53] States must also notify the UNSC immediately of measures taken in self-defence.[54] Charter obligations, including those dealing with force and self-defence, supersede obligations arising under later treaties and agreements.[55]

CIL requires "a necessity of self-defence, instant, overwhelming, leaving no choice of means, and no moment for deliberation" for its legitimate exercise.[56] States may not take unreasonable or excessive action in self-defence.[57] Thus, the principles of proportionality and necessity curb self-defence as a matter of CIL. Lawful and proportionate self-defence under the Charter and CIL must also comply with IHL.[58] Accordingly, legitimate use of force depends on the type of weapons used and how they were used.[59]

States often invoke self-defence to justify maintaining armed forces.[60] However, the right only arises if an armed attack occurs.[61] A state must prove it was the victim of an intentional armed attack before resorting to self-defence.[62] Nevertheless, the Charter does not prohibit activities falling short of the requirements for self-defence, such as developing and stockpiling armaments.[63]

Self-defence applies to armed attacks by other states. However, uncertainty arises around attacks by non-State actors.[64] Large-scale attacks by non-State actors may meet the threshold for

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51 At 30.

52 At 32.

53 Article 51.

54 Hansen, above n 43, at 33.

55 Article 103; and VCLT, above n 32, art 30.1.

56 Shaw, above n 26, at 861.

57 At 861.

58 At 868-869.

59 At 909.

60 Lyall and Larsen, above n 1, at 504.

61 Shaw, above n 26, at 863.

62 At 862.

63 Hansen, above n 43, at 34.

64 Shaw, above n 26, at 863.

self-defence without attribution to another state, justifying the use of force by the victim State.[65]

Another issue is whether the right of anticipatory or pre-emptive self-defence exists. Modern weaponry enables swift attacks, leaving target States with little time to respond.[66] Anticipatory self-defence arises where a specific event triggers an imminent threat of armed attack.[67] By contrast, pre-emptive self-defence is triggered by a general apprehension of an armed attack and is unrelated to a specific event.[68] Self-defence extends to responses to attacks reasonably and evidentially perceived as imminent. Therefore, anticipatory self-defence falls within international law limits, whereas pre-emptive self-defence goes beyond what is acceptable.[69]

OST

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, also known as the Outer Space Treaty (OST),[70] is the principal treaty relating to space. It is widely ratified by 110 State Parties, including the space powers. No state has withdrawn from the OST, nor has a state ever proposed an amendment.[71] Some OST principles may also be binding as CIL, meaning states cannot escape responsibility by withdrawing from the OST or by altering such principles in any subsequent agreement.[72]

1 Freedom principle

All states are free to explore and use outer space without discrimination, based on equality and international law (freedom principle).[73] This principle guides the interpretation of the OST and other international instruments concerning space activities.[74]

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65 At 865.

66 At 866.

67 Lyall and Larsen, above n 1, at 504.

68 At 505.

69 Shaw, above n 26, at 867-868.

70 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies 610 UNTS 205 (opened for signature 27 January 1967, entered into force 10 October 1967) [OST].

71 Masson-Zwaan and Hofmann, above n 1, at 16.

72 At 54 and 70. For further explanation, see pages 70-79.

73 OST, above n 70, art I.

74 Hansen, above n 43, at 38.

The freedom principle is not unlimited; other international space law provisions carve out a regulatory regime for competing interests. States must conduct their outer space activities "for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development" because outer space is the province of all humankind.[75] As individual states may reasonably have competing and conflicting interests, it is the interests of the international community in the peaceful use of outer space that should be considered.[76] Other international space law provisions deal with competing interests.[77]

2 Partial demilitarisation

Article IV, the only provision expressly dealing with the militarisation of outer space, purports to advance demilitarisation in two ways. First, State Parties are prohibited from placing nuclear weapons (NW) or weapons of mass destruction (WMD) in the Earth's orbit, on celestial bodies or "in outer space in any other manner".[78] The article notably does not forbid the use of conventional weapons generally or WMD in wartime.[79]

Secondly, art IV prohibits the establishing of military bases, testing of weapons and conducting of military manoeuvres on celestial bodies. The ban on military bases is partial because States may use military bases for scientific research and peaceful purposes.[80] Since these prohibitions relate only to celestial bodies, States may use outer space for military activities.[81]

3 Ancillary obligations

The OST imposes ancillary obligations on State Parties that are relevant despite not being directly related to space militarisation.[82] First, States must conduct their space activities following international law, including the Charter.[83] Accordingly, all sources of international law regulate space activities.

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75 OST, above n 70, art I.

76 Chatterjee, above n 13, at 29.

77 At 39.

78 OST, above n 70, art IV.

79 Hansen, above n 43, at 39.

80 Article IV.

81 Chatterjee, above n 13, at 30.

82 Hansen, above n 43, at 40.

83 Articles I and III.

Secondly, State Parties must assist astronauts during events of accident or distress. This includes returning them to the state of registry of their space vehicle in cases of emergency landing.[84] Thus, while astronauts may act as military personnel, State Parties must not regard them as foreign or enemy military personnel and hold them as prisoners when they crash-land. Appropriately, this obligation applies equally on Earth and in space.[85]

Thirdly, State Parties are internationally responsible for their activities in space. They must ensure that their citizens comply with the OST in carrying out space activities.[86] Furthermore, State Parties that launch, procure launching or provide their territory or facilities for launching (Launching States) are internationally liable for damage caused by their space activities.[87] Such liability is merely conditional on the State launching a space object, and so arises irrespective of the type of activity undertaken.[88]

Fourthly, the OST requires State Parties to conduct their space activities with due regard to other State Parties' interests (due regard principle).[89] Article IX suggests that purely bilateral conflicts cannot exist in outer space given the widespread effects of materially destructive armed conflict.[90] Under art IX, State Parties must also avoid "harmful contamination" of outer space and the celestial bodies.

Article IX provides a consultation mechanism for resolving competing interests where "harmful interference" is possible. International consultation on harmful space activities, including in relation to space weapons, has three requirements:

(1) a State Party has conducted an activity in outer space;
(2) another State Party has reason to believe the activity would cause potentially harmful interference; and
(3) that harmful interference concerns the peaceful use and exploration of outer space by any State Party.[91]

State Parties that believe they may cause harmful interference must initiate consultation, and those that believe they are at risk of harmful interference have a right to request consultation.[92]

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84 Article V.

85 Hansen, above n 43, at 41.

86 Article VI.

87 Article VII.

88 Hansen, above n 43, at 41, n 76.

89 Article IX.

90 Hansen, above n 43, at 47.

91 Chatterjee, above n 13, at 31.

92 Article IX; and Hansen, above n 43, at 45.

Moon Agreement

The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement)[93] has limited legal effect. It has a low uptake by space-faring nations and has just 18 State Parties. Moreover, it merely reiterates several OST obligations.[94] While the Moon Agreement improves legal safeguards for preventing space debris contamination,[95] it does not extend to the outer space environment more generally.[96]

Rescue Agreement

The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement)[97] elaborates on arts V and VIII of the OST and has 98 State Parties. The Rescue Agreement has two aspects:[98] first, the recovery and return of astronauts;[99] and secondly of space objects and their components.[100]

The Rescue Agreement has some relevance to the militarisation of outer space. Astronauts engaging in hostilities during wartime lose the benefit of being treated under the Rescue Agreement. Instead, they qualify as prisoners of war under IHL.[101]

Liability Convention

The Convention on International Liability for Damage Caused by Space Objects (Liability Convention)[102] creates a regime for compensating victims of damage caused by space objects belonging to Launching States. It expands on arts VI and VII of the OST and has 98 State Parties,[103] but also applies to international intergovernmental

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93 The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies 1363 UNTS 3 (opened for signature 18 December 1979, entered into force 11 July 1984) [Moon Agreement].

94 For example, art 3(3) of the Moon Agreement resembles art IV of the OST.

95 Articles 7(1) and 11.

96 Chatterjee, above n 13, at 39.

97 The Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space 672 UNTS 119 (opened for signature 22 April 1968, entered into force 3 December 1968).

98 Masson-Zwaan and Hofmann, above n 1, at 24.

99 Articles 1-4.

100 Article 5.

101 Hansen, above n 43, at 41.

102 The Convention on International Liability for Damage Caused by Space Objects 961 UNTS 187 (opened for signature 29 March 1972, entered into force 1 September 1972) [Liability Convention].

103 Masson-Zwaan and Hofmann, above n 1, at 24.

organisations.[104] The term "space object" includes the launch vehicle and its components and parts,[105] which likely covers space debris.[106] The definition of "damage" extends to satellites and other objects which may be the target of a space weapons attack.[107] Under the Liability Convention, victim States may hold any State within the meaning of Launching State[108] liable for damage incurred.[109]

1 Grounds for liability

Two types of liability exist under the Liability Convention: absolute liability for damage caused on Earth's surface or to aircraft in flight;[110] and fault-based liability for damage caused elsewhere than on Earth's surface.[111] The rationale for this distinction is that Launching States knowingly engage in high-risk activities beyond the Earth's surface, justifying fault-based protection. However, third parties on Earth deserve complete protection from damage caused by a Launching State's space activities.[112]

Absolute liability means Launching States are liable no matter the circumstances, including force majeure events. Therefore, the victim state can claim directly.[113] However, Launching States conforming with international law have a defence under art VI where there is contributory negligence by the claimant state.

On the other hand, fault-based liability entails claimant states proving causation from intentional or negligent acts by Launching States and disproving contributory negligence. The burden of proof creates difficulties for victim states claiming compensation from Launching States.[114]

Compensation is based on the circumstances of the incident and is determined according to relevant principles of international law, equity and justice.[115] Nevertheless, no state has relied on the

104 Article XXII.

105 Article I(d).

106 Lyall and Larsen, above n 1, at 107.

107 Article I(a); and Chatterjee, above n 13, at 36.

108 Although "launching State" is a defined term in the Liability Convention, its meaning is materially the same as that used in art VII of the OST, except that "launching" under the Liability Convention includes attempted launching: art I(b).

109 Masson-Zwaan and Hofmann, above n 1, at 27.

110 Articles II and IV(1)(a).

111 Articles III and IV(1)(b).

112 Hansen, above n 43, at 42.

113 Chatterjee, above n 13, at 36.

114 At 36.

115 Article XII.

Liability Convention for compensation, despite past occurrences of damage caused by satellites.[116]

2 Resultant damage

Both types of liability also apply to resultant damage.[117] Where a collision between space objects belonging to state A and state B causes resultant damage to state C, both states A and B are jointly and severally liable to state C.[118] Consequently, state C may seek compensation in full from either state A or state B or both. States A and B may apportion the burden between themselves to the extent that they were at fault.[119] Otherwise, where the extent of fault is indeterminable, states A and B will bear the burden equally.[120]

Registration Convention

The Convention on Registration of Objects Launched into Outer Space (Registration Convention) has 70 State Parties. [121] It builds upon the preference expressed by states in the other treaties for a mechanism to identify space objects and expands the scope and practical effect of art VIII of the OST.[122] Again, the term space object may capture space debris.[123] Despite the possible participation of several Launching States, there can only be one state of registry.[124]

1 Dual system of registration

The Registration Convention establishes a dual system of registration for space objects. It establishes a national register maintained by Launching States,[125] accessible only with the particular state's permission,[126] and an international register that is open to the public and maintained by the United Nations Secretary-General (Convention Register).[127] States may also notify the Office for Outer Space Affairs

116 Masson-Zwaan and Hofmann, above n 1, at 30.

117 Articles IV(1)(a) and IV(1)(b).

118 Liability Convention, above n 102, art IV(1).

119 Article IV(2); and Lyall and Larsen, above n 1, at 109.

120 Article IV(2).

121 The Convention on Registration of Objects Launched into Outer Space 1023 UNTS 15 (opened for signature 14 January 1975, entered into force 15 September 1976).

122 Masson-Zwaan and Hofmann, above n 1, at 31.

123 Lyall and Larsen, above n 1, at 86.

124 Hansen, above n 43, at 44.

125 Article II.

126 Lyall and Larsen, above n 1, at 87.

127 Article III.

(UNOOSA) of launches under Resolution 1721 (Resolution Register).[128]

UNOOSA estimates that states have registered over 87 per cent of all functional space objects through either the Convention or Resolution Registers (together, the international register).[129] States use the international register to plan their space activities and identify space objects causing damage when determining liability.[130] However, States freely interpret the reporting requirements, meaning there is no consistent international practice.[131] UNOOSA maintains the international register and includes unofficial information about objects of which it is aware but were never formally notified.[132]

IV DISARMAMENT AND IHL

In addition to space law, IHL and disarmament law curtail the extent to which states may militarise space.[133]

IHL

IHL aims to limit suffering during wartime rather than determine whether a war is legal.[134] It applies to all armed conflict, including in self-defence, irrespective of whether the right to wage war is engaged.[135] IHL originated as CIL but was later codified by the Hague Convention of 1907[136] and the four Geneva Conventions of 1949[137] and supplemented by three Additional Protocols.[138] Customary IHL

128 *International co-operation in the peaceful uses of outer space* GA Res 1721 (1961); and Hansen, above n 43, at 43.

129 UNOOSA "United Nations Register of Objects Launched into Outer Space" < www.unoosa.org>.

130 Lyall and Larsen, above n 1, at 89.

131 Masson-Zwaan and Hofmann, above n 1, at 32.

132 Lyall and Larsen, above n 1, at 89.

133 Masson-Zwaan and Hofmann, above n 1, at 71; and OST, art III.

134 Hansen, above n 43, at 35.

135 Su, above n 19, at 69.

136 Hague Convention (IV) Respecting the Laws and Customs of War on Land 2 UST 2269 (opened for signature 18 October 1907, entered into force 26 January 1910).

137 Geneva Convention for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field 75 UNTS 31 (opened for signature 12 August 1949, entered into force 21 October 1950); Geneva Convention for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea 75 UNTS 85 (opened for signature 12 August 1949, entered into force 21 October 1950); Geneva Convention Relative to the Treatment of Prisoners of War 75 UNTS 135 (opened for signature 12 August 1949, entered into force 21 October 1950); and Geneva Convention Relative to the Protection of Civilian Persons in Time of War 75 UNITS 287 (opened for signature 12 August 1949, entered into force 21 October 1950) [GC IV].

138 Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I) 1125 UNTS 3 (entered into force 7 December 1978) [API]; Protocol

rules survive codification, and the basic rules are peremptory norms.[139] However, controversial provisions such as in Additional Protocols I and II (API and APII) are not CIL.[140]

1 Conduct of war

When the general rules prohibiting the use of armed force have broken down, IHL takes precedence over space law concerning hostilities in space.[141] Four main principles of IHL govern the conduct of war: necessity, distinction, proportionality and humanity.[142]

The necessity principle requires a logical connection between the destruction caused and the military objective secured.[143] Similarly, the distinction principle prohibits indiscriminate attacks. Therefore, States must never make civilians the target of an attack and must not use weapons incapable of distinguishing between military and civilian objectives.[144] Military objectives are objects which, "by their nature, location, purpose or use make an effective contribution to military action and whose total or partial destruction, capture or neutralisation ... offers a definite military advantage".[145]

The proportionality principle balances the military advantage gained by an attack against the damage caused to non-combatants.[146] Thus, it is illegal to attack a legitimate military target where the collateral civilian cost is disproportionate to the military advantage. However, this calculus is problematic where dual-use objects (for example, bridges, roads and power stations) are concerned.[147] Lastly, the humanity principle implies that what IHL does not expressly forbid is not necessarily allowed.[148]

In addition, API prohibits means or methods of warfare intended or expected to cause widespread, long-term and severe

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Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of Non-International Armed Conflicts (Protocol II) 1125 UNTS 609, (entered into force 7 December 1978) [APII]; and Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Adoption of an Additional Distinctive Emblem (Protocol III) 2404 UNTS 261 (entered into force 14 January 2007) [APIII].

139 *Report of the International Law Commission*, above n 42, at 147.

140 Shaw, above n 26, at 892.

141 Masson-Zwaan and Hofmann, above n 1, at 71.

142 Hansen, above n 43, at 35-36.

143 At 36; GC IV, above n 138, art 53; and API, above n 138, arts 54(5) and 62(1).

144 Shaw, above n 26, at 906 and 909; and API, art 48.

145 At 906; and API, art 52(2).

146 Chatterjee, above n 13, at 34.

147 Shaw, above n 26, at 906.

148 Hansen, above n 43, at 37. The humanity principle is a general principle of international law, a CIL norm, and a treaty principle.

damage to the natural environment.[149] It also places some limits on developing new weapons. Developers must determine whether API or any other rule of international law would prohibit the use of their weapons in some or all circumstances.[150] In this way, IHL constrains the methods of warfare available to belligerents.[151]

ENMOD

The Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD) has 78 State Parties, including the space powers.[152] It prohibits military or any other hostile use of environmental modification techniques that create widespread, long-lasting or severe environmental effects to inflict destruction, damage or injury. Three parameters inform the meaning of "military or any other hostile use" of such techniques: the area, duration, and intensity of the phenomenon modifying the environment.[153]

ENMOD also prohibits states from assisting, encouraging or inducing the use of environmental modification techniques.[154] State Parties must take appropriate and necessary measures to prohibit and prevent any activity violating the provisions of ENMOD anywhere under its jurisdiction or control.[155] Yet, the convention lacks a verification mechanism.[156]

PTBT

The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water, also known as the Partial Nuclear-Test-Ban Treaty (PTBT), has 125 State Parties. [157] It prohibits the testing of (or participating in, or encouraging the testing of) NW payloads in outer space.[158] Any testing that would cause radioactive

149 API, above n 138, art 35(3).

150 API, above n 138, art 36.

151 Shaw, above n 26, at 908.

152 The Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques 1108 UNTS 151 (opened for signature 4 October 1978, entered into force 5 October 1978), art 1(1).

153 United Nations Institute for Disarmament Research "Prevention of an Arms Race in Outer Space: A Guide to the Discussions in the Conference on Disarmament" UNIDIR 91/79 (1 October 1991) [UNIDIR] at 71-72.

154 Article I(2).

155 Article IV.

156 UNIDIR, above n 153, at 72.

157 The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water 480 UNTS 43 (opened for signature 5 August 1963, entered into force 10 October 1963).

158 Article 1.

debris to reach outer space is also prohibited.[159] However, the PTBT only forbids the *testing* of specific payloads; it does not stop State Parties from placing or using weapons in outer space, nor does it address other weapon types.[160]

CTBT

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) is a complete ban on nuclear tests and explosions.[161] Although it has not yet entered into force, the CTBT has had a normative effect and its verification system is operating effectively.[162] States have accordingly stopped testing NW (except North Korea, the only country to conduct nuclear tests this Century).[163] However, the CTBT does not add any space-related arms control provisions not already contained in the PTBT.[164]

V CHANGING LANDSCAPE

The use and exploration of space have changed since the international legal framework was established. States could not have envisaged many of the developments outlined below when drafting the space treaties discussed above. Therefore, whether the legal framework remains fit-for-purpose must be assessed considering these developments. This analysis identifies gaps in the legal framework and their associated risks.

Increasing Privatisation

Traditionally, space has been the domain of states due to the prohibitive costs of space exploration. However, the OST opened the way for the private sector to develop space activities alongside states.[165] In the new space economy, a broader range of actors can access space because increased competition has decreased the costs of space exploration.

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159 Article 1(1)(b).

160 UNIDIR, above n 153, at 70.

161 Comprehensive Nuclear-Test-Ban Treaty, 35 ILM 1439, (opened for signature 24 September 1996, not yet in force).

162 Anguel Anastassov "Are Nuclear Weapons Illegal? The Role of Public International Law and the International Court of Justice" (2010) 15(1) JC&SL 65 at 67.

163 Comprehensive Nuclear-Test-Ban Treaty Organization "Nuclear Testing 1945 – Today" <www.ctbto.org>.

164 Hebert, above n 4, at 5.

165 Masson-Zwaan and Hofmann, above n 1, at 20.

Moreover, the prohibitive costs of space have encouraged the use of dual-use technology, causing passive military activity and peaceful scientific purposes to become increasingly intertwined. This co-operation is essential for ensuring efficient space exploration (thereby minimising costs) and reducing orbital debris created by break-away vehicles.[166]

Technological Advancements

Since its initial development, space law has been unable to keep up with the pace of change set by technology.[167] The new space economy is characterised by commercial actors sending increasing numbers of small satellites to LEO. Simultaneously, states (and inter-governmental organisations) continue their old space economy activities of sending large satellites into geostationary Earth orbit.[168] Consequently, space is becoming more congested, competitive and contested.[169]

While the technology used to get to space is developing, so too is weapons technology. Existing systems only require minor modifications to act as ASATs. Moreover, successfully detonating a non-WMD warhead near a space-based target does not require precise orbital parameters.[170] As such, space and space weapons are now more accessible than ever.

Increasing Reliance on Space

As technology develops (particularly dual-use systems), militaries and civilians alike increasingly rely on satellites.[171] A corollary is that satellites have become more attractive targets to belligerents. The enmeshment of satellites with civilian and military infrastructure means an attack on them would create chaos and potentially trigger the world's first space war.[172]

Consequently, the number of entities prepared to protect their space assets will increase as the new space economy continues to flourish.[173] The privatisation of space assumes military and

166 Taft, above n 2, at 371.

167 Lyall and Larsen, above n 1, at 2.

168 Freeland, above n 16, at 145.

169 Hebert, above n 4, at 2.

170 At 10-11.

171 Lubojemski, above n 6, at 127.

172 Niall Firth "How to fight a war in space (and get away with it)" *MIT Technology Review* (online ed, Cambridge, 26 June 2019).

173 Hebert, above n 4, at 2.

commercial space policies are compatible. However, this may not always be the case.[174] There is scope for private actors to pursue their interests in violation of space law, which might entail responsibility for their authorising state.[175]

VI INADEQUATE LEGAL FRAMEWORK

Analysing the regime's fitness-for-purpose entails cumulatively applying the multi-layered legal framework. However, this is difficult in practice because different laws may hinder each other and produce gaps in the regulatory regime.[176] The following analysis demonstrates that the international framework is inadequate for regulating space weapons. While the law curtails the use of space weapons in some circumstances, many lacunae must be addressed to preserve the space environment for all.

It is self-evident why a state may want to control the ultimate high ground of space, considering the unique military advantage over the entirety of the Earth.[177] Without adequate legal restrictions, there is an incentive to be the first to weaponise space. Accordingly, it is preferable to proactively address space weaponry in peacetime rather than after a conflict has broken out.[178]

Regulating Active Military Uses

Military satellites may be either passive or active, and offensive or defensive, in their application. Active systems are often offensive because they create or support an attack to harm or damage an opponent's infrastructure. Satellites guiding missiles on Earth or ASATs are examples of active systems. By contrast, passive systems are generally defensive because they aid military operations but do not present a direct threat.[179] Examples include satellites involved in communications, navigation, surveillance and early warning.[180]

Dual-use systems create difficulties for states in differentiating between offensive and defensive systems and identifying space

174 Paul Larsen "Outer Space Arms Control: Can the USA, Russia and China Make this Happen" (2018) 23(1) JC&SL 137 at 144.

175 At 144.

176 Hansen, above n 43, at 47.

177 Lyall and Larsen, above n 1, at 499.

178 Taft, above n 2, at 370.

179 Lubojemski, above n 6, at 134.

180 Su, above n 19, at 82.

weapons. This inherent difficulty encourages states to take countermeasures for ensuring their security, including deploying space weapons.[181] The lack of an agreed definition of space weapons and the ambiguity of dual-use satellites complicates the task of negotiating restrictions on space weapons, ultimately worsening the security situation and making an arms race in outer space more likely.[182]

The legal framework is inadequate for two reasons: it lacks an internationally accepted definition of space weapons; and it does not contain mechanisms (for instance, Trust and Confidence Building Measures) to reduce uncertainty around dual-use technology.[183] While the militarisation of space has primarily focused on passive uses,[184] which are permissible under the current framework,[185] international law must develop to constrain active military uses before conflict spreads to outer space.

In its 2019 Report, the United Nations Committee on the Peaceful Uses of Outer Space expressed that preventing conflicts in outer space was now more relevant than ever, and there was a lack of measures undertaken by states in that regard.[186] The absence of past conflicts is no guarantee against future conflicts since new actors and technology are entering the space arena.[187] Constraining active military uses of space is particularly pertinent considering the former President of the United States, Donald Trump, announced that "space is the world's newest war-fighting domain" in the signing ceremony for the defence Bill creating the Space Force.[188] Considering this announcement and the recent speculation that the United States Defense Department may declassify and demonstrate the capabilities of a new space weapon in the last quarter of 2021, the long-standing belief that space is not yet weaponised is now uncertain.[189]

The critical question is what type of classified weapons the United States has developed and whether it has already stationed these weapons in space. Space-based weapons are the most likely candidate given the United States has already demonstrated an Earth-based

181 Lubojemski, above n 6, at 135.

182 At 135.

183 At 135.

184 Taft, above n 2, at 370.

185 Su, above n 19, at 82.

186 *Report of the Committee on the Peaceful Uses of Outer Space LXII* UN Doc A/74/20 (20 August 2019) at [51].

187 At [54].

188 Garret Graff "The US Space Force Has a Rough Launch on the Internet" *Wired* (online ed, California, 28 January 2020).

189 Theresa Hitchens "Exclusive: Pentagon Poised To Unveil, Demonstrate Classified Space Weapon" *Breaking Defense* (online ed, New York, 20 August 2021).

ASAT.[190] The United States has also accused Russia of testing a space-based ASAT, which adds weight to the possibility that the United States may too be developing space-based ASATs.[191]

Armed Force in Outer Space

Non-aggression, as a peremptory norm, may form a legal challenge to the deployment of space weapons (as manifestations of the use of force) in some circumstances.[192] However, the Charter does not prohibit developing and stockpiling space weapons. Moreover, testing and deploying space weapons for national security during peacetime, without an express or implied threat of use, does not breach the principle of non-aggression.[193]

1 WMD in self-defence

Articles IV and IX of the OST add space-specific layers of protection to the Charter regarding militarisation of outer space.[194] Where there is inconsistency, the Charter obligations prevail.[195] However, this hierarchical relationship only applies to obligations: Charter rights do not take precedence over rights or obligations in other international agreements.[196]

Consequently, the restrictions in art IV of the OST (and other limitations on militarisation contained in the regulatory regime) also apply to military space activities conducted in self-defence.[197] Nevertheless, the role of the prohibition on stationing or placing WMD in orbit in circumstances of self-defence is unclear. The ban on military uses of the moon and celestial bodies more clearly curbs otherwise legitimate self-defence.[198] The same reasoning applies to the demilitarisation provision in art 3 of the Moon Agreement.[199]

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190 Theresa Hitchens "What Satellite Attack Weapon Might The US Reveal Soon?" *Breaking Defense* (online ed, New York, 24 August 2021).

191 United States Space Command "Russia tests direct-ascent anti-satellite missile" (15 April 2020) Department of Defense <www.spacecom.mil>.

192 Chatterjee, above n 13, at 33.

193 Su, above n 19, at 68. However, API imposes some limits on weapons development.

194 Hansen, above n 43, at 48.

195 Charter, above n 39, art 103.

196 Hansen, above n 43, at 49.

197 At 49.

198 At 49.

199 At 49.

Conversely, uses of force authorised by UNSC mandate are not subject to later restrictions in other international agreements.[200] The power of the UNSC to authorise the use of force further carves out the protections afforded by these demilitarisation provisions; states can ignore them when acting under UNSC mandate.[201] On the other hand, the relevance of WMD-related prohibitions is questionable as it is unlikely the UNSC would mandate the stationing or orbit of WMDs.[202]

2 Limited means and methods

IHL limits the choices of space weapons available to belligerents.[203] States must choose means and methods of warfare that achieve the military objective with the least possible damage to the space environment and least superfluous suffering.[204]

IHL prohibits the use of debris-causing weapons because they violate the principles of distinction and proportionality.[205] Debris-causing space weapons create widespread, long-term and severe damage to the space environment. The calculus of proportionality is problematic in the space environment due to both humankind's common interest in outer space and the physical properties of orbital operations.[206] Nevertheless, the debris cloud created by space weapons indiscriminately affects civilian satellites and impedes the peaceful uses of space by other states in the long-run.

The most significant defect of IHL is that it only applies during times of conflict. This limited application means that, like the Charter, IHL poses no challenge to deploying and testing space weapons in peacetime. Moreover, the distinction principle does not completely prevent states from using space weapons during armed conflict. For example, DE weapons strike with extreme precision and may not classify as indiscriminate.[207] Nevertheless, they remain subject to the other IHL principles.[208]

Targeting military and dual-use systems offer military advantages for belligerents by their nature and use. Therefore, they

200 At 52.

201 At 51.

202 At 51.

203 Masson-Zwaan and Hofmann, above n 1, at 72.

204 Hansen, above n 43, at 57-58.

205 Masson-Zwaan and Hofmann, above n 1, at 72.

206 At 55-56.

207 Chatterjee, above n 13, at 34.

208 Hansen, above n 43, at 55.

qualify as legitimate military objectives.[209] However, the innate ambiguity of dual-use satellites makes it difficult to determine their genuine function and purpose.[210] Future military uses of civilian systems are also indeterminable, which adds to the difficulty of identifying them as military or civilian objectives.[211]

The multinational nature of many satellites further complicates this assessment.[212] The effects of a space weapon attack — debris-causing or not — are not confined to one state's population as with traditional warfare. For example, civilians of the victim state and third-party states may enjoy the benefits of dual-use satellites. A space weapon attack impairing these benefits is analogous to destroying civilian objects.[213] Therefore, it is arguably illegal to use space weapons against assets benefiting civilians because of the indiscriminate and disproportionate effects.

In summary, IHL prohibits debris-causing weapons and weapons targeting assets benefiting civilians during wartime only.

Gaps in the Law

The United Nations General Assembly has persistently addressed weaponisation by adopting annual resolutions on the Prevention of an Arms Race in Outer Space (PAROS). Other PAROS efforts include a draft multilateral treaty banning the placement of weapons in space presented in the Conference on Disarmament, and the push for a non-legally binding Code of Conduct for space activities.[214] These efforts recognise that the existing international legal framework cannot entirely prevent the weaponisation of outer space. Therefore, there is a need to consolidate and reinforce this regime.[215]

1 WMD-centric treaties

Existing treaties restrict WMD but allow all other weapon types. The OST does not prohibit non-WMD in space, ICBMs with nuclear warheads flying in orbit for part of Earth's circumference, space debris from weapons attacks or dual-use spacecraft.[216] Similarly, the

209 At 54-55.

210 Masson-Zwaan and Hofmann, above n 1, at 72.

211 Hansen, above n 43, at 54-55.

212 Masson-Zwaan and Hofmann, above n 1, at 73.

213 Hansen, above n 43, at 56; and API, above n 138, art 57(2)(a)(ii).

214 Masson-Zwaan and Hofmann, above n 1, at 70.

215 *Prevention of an arms race in outer space: further practical measures for the prevention of an arms race in outer space* GA Res 74/34 (2019) at 1.

216 Taft, above n 2, at 366.

PTBT and CTBT do not restrict using spacecraft or satellites as WMD delivery systems, nor do they mention other weapon types. Thus, they all lack essential arms control provisions to curtail the increasing militarisation of outer space.[217]

While the treaties successfully keep WMD out of space, these weapons are no longer the primary concern.[218] There are parallels between WMD and debris-causing weapons in terms of the long duration of their incidental and indiscriminate effects.[219] For instance, KE weapons create a debris cloud by releasing energy upon the destruction of their targets, resulting in fragments taking anywhere between days and centuries to re-enter Earth's atmosphere.[220]

The use of debris-causing weapons by actors with little or no vested interest in space is most concerning because they have nothing to lose by creating more space debris. Due to technological advancements, hostile actors only require enough money to buy space weapons rather than develop their own.[221] Consequently, Earth-based ASATs pose the "most pressing, existing threat to outer space systems".[222]

Additionally, no treaty prohibits the use of information weapons. These are weapons used to damage another state's information resources, processes and systems.[223] Examples include radio jammers, electromagnetic pulsed weapons and DE weapons.[224] Information weapons that render satellites temporarily or permanently inactive are possible applications of Earth-based and space-based ASATs.

Altogether, there is no principled basis for confining the scope of the space weapon prohibitions to WMD. States knew little about space and its potential uses when developing the current legal framework.[225] The arms control provisions cannot account for future capabilities.[226] Had the original drafters foreseen the full military potential of space, they would have made greater efforts towards demilitarisation for a broader range of space weapons.

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217 Hebert, above n 4, at 5.

218 Taft, above n 2, at 369.

219 Hansen, above n 43, at 57.

220 At 58.

221 Hebert, above n 4, at 10.

222 Su, above n 19, at 81.

223 Stockholm International Peace Research Institute "SIPRI Yearbook 2019: Armaments, Disarmament and International Security" (Oxford University Press, Oxford, 2019) at 484.

224 At 484.

225 Masson-Zwaan and Hofmann, above n 1, at 46.

226 Hebert, above n 4, at 4.

2 Logical inconsistencies for debris-causing weapons

Commercial satellites may legitimately become military objectives under certain conditions, making it legal for states to target these and other enemy satellites. However, IHL limits the means and methods of warfare available. IHL prohibits the use of both space-based and Earth-based debris-causing space weapons in conflicts, including KE weapons.[227]

Whether IHL prohibits information weapons that do not produce a debris cloud is uncertain. Indeed, IHL may incentivise the use of information weapons to disable satellites instead of destroying them outright.[228] Nevertheless, non-functional satellites lack manoeuvrability and may still contribute to the Kessler Syndrome[229] through random collisions. Therefore, IHL may prohibit information weapons that disable all LEO assets during wartime because this would create a massive debris cloud of inactive satellites.[230]

Comparatively, IHL does not restrict using or deploying debris-causing weapons where there is no armed conflict. Nor can the UNSC intervene where there is no breach of the peace. Similarly, ENMOD does not prohibit non-hostile techniques. Therefore, ENMOD, IHL and the Charter do not prohibit researching, testing and deploying military techniques which may modify the environment during peacetime, such as debris-causing weapons.[231]

Thus, a paradox exists: what is illegal in wartime may be legal during peacetime.[232] The law prohibits debris-causing space weapon attacks in wartime but does not prohibit states from testing space weapons on their satellites in peacetime. This paradox is illogical and incongruous, considering the identical environmental consequences of using and testing space weapons.[233]

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227 Su, above n 19, at 84.

228 Hansen, above n 43, at 58-59.

229 A chain reaction of increasing collisions between debris and space objects, leading to more debris.

230 Masson-Zwaan and Hofmann, above n 1, at 73.

231 UNIDIR, above 153, at 72.

232 Hansen, above n 43, at 59.

233 For example, the Chinese ASAT test in 2007 created more than 2,300 pieces of debris; and Davenport, above n 9.

Environmental Contamination

1 Wartime

The ENMOD principles align with API,[234] IHL's prohibitions on the means and methods of warfare with harmful environmental consequences, and the duty to consult where there is potentially harmful contamination.[235] Self-defence also applies to exclude wrongful acts between belligerent parties but not downstream harm to third parties resulting from those acts. Therefore, third parties must rely on the OST's prohibition on harmful interference to protect against damage caused by belligerents during armed conflict.[236]

Together, these provisions indirectly limit military uses of outer space.[237] The ban catches space weapons that create debris (including those disabling multiple satellites) because they modify the space environment. However, the ban's legal effect depends on the orbital plane of the attack and only applies during wartime.[238] For example, targeting the only satellite in a remote orbit is not indiscriminate. Conversely, targeting a satellite in the same orbit as the International Space Station is illegal due to the risk of harm to its personnel.[239]

The due regard principle, consultation mechanism, and IHL in combination create a double condition for states intending to use force in outer space.[240] First, the state must meet the conditions imposed by the Charter around the use of force. Then, the state must consult third-party states who may suffer harmful interference from the use of armed force in outer space.[241]

It is doubtful whether the language prescribing consultation in art IX of the OST is sufficiently strong to create binding legal obligations.[242] The OST neither sanctions states for contaminating nor prohibits expressly harmful contamination.[243] As such, this provision's deterrent effect is questionable.

Furthermore, Hebert shows that the three consultation conditions on harmful interference do not cover all types of space

234 API, above n 138, art 35(3).

235 OST, above n 70, art IX.

236 Hansen, above n 43, at 50.

237 At 45-46.

238 Masson-Zwaan and Hofmann, above n 1, at 73.

239 At 72.

240 At 46.

241 At 46.

242 At 21.

243 Chatterjee, above n 13, at 39.

weapon activities.[244] Earth-based activities, such as targeting satellite uplinks to disrupt orbiting satellites, do not satisfy the first condition. The second requirement is ambiguous given there is no definition of harmful interference. Irrespective, using the International Telecommunications Union definition excludes various forms of physical interference.[245] The third condition requires the victim state to prove it was engaging in peaceful activities. Therefore, it may exclude space weapon attacks on military satellites.[246]

Lastly, the nature of the consultation and relevant procedural mechanisms for harmful space activities are unspecified. There is also no recourse for when consultation fails. Thus, even if a state overcomes the hurdles of meeting the conditions for consultation, they have no definitive legal recourse for preventing space weapon attacks that will interfere with their peaceful space activities.[247]

2 Weapons testing

As mentioned above, neither IHL, ENMOD, nor the Charter prohibits space weapons tests during peacetime. Moreover, the PTBT only prohibits NW payloads. There are two avenues under the treaty system for third-party states affected by these tests: the liability regime under the Liability Convention and OST; and the consultation mechanism under the OST.[248]

Applying the liability regime requires the victim state to suffer damage of the specified kind at the hands of an identifiable Launching State. In-orbit damage has the added requirement of fault.[249] The due regard principle may secure non-binding technical norms on debris mitigation in treaty law. Wilful deviation from agreed standards of conduct by a state raises the presumption of a lack of due regard, thereby proving fault under the Liability Convention.[250]

International consultation for harmful activities is triggered once the three consultation conditions are satisfied. Debris-causing space weapons tests contravene the due regard principle because they generate harmful contamination in outer space. Thus, states planning

244 Hebert, above n 4, at 31.

245 Constitution and Convention of the International Telecommunication Union (with annexes and optional protocol) 1825 UNTS 332 (opened for signature 22 December 1992, entered into force 1 August 1994) at 387.

246 Hebert, above n 4, at 31.

247 At 31.

248 Hansen, above n 43, at 59.

249 At 60.

250 At 46.

such tests must consult those whose interests would be affected.[251] However, art IX of the OST does not outlaw testing space weapons; it only requires consultation with potential victims beforehand and remediation of damage afterwards.[252] As such, protections against weapons testing is limited.

Difficulty Determining Liability

While it is unclear whether the liability regime under the Liability Convention applies between belligerent parties, it certainly applies to third parties harmed by military activities on Earth and in outer space. Damage resulting from breaches of the principle of non-aggression would qualify under the liability regime. However, the process for determining fault for other activities is unclear.[253] Difficulties in determining liability, coupled with the inability to clear space debris, show it is preferable to prevent the development and testing of space weapons rather than respond to the consequences of their use.

A key issue is that the Liability Convention's definition of space object is ambiguous when it comes to fragments and microparticulate matter.[254] The definition also does not account for the debris caused by space weapon attacks.[255] Even if it covers these types of space debris, resultant damage falls under the fault-based liability regime.[256]

A fault-based regime for in-orbit damage fails to protect victim states because there is no internationally accepted tracking mechanism for establishing a space object's identity.[257] A victim state would therefore struggle to prove causation when making a claim. Additionally, the definition of damage does not capture the full range of damage caused by space debris since it does not address damage to the space environment.[258] Accordingly, these difficulties in determining liability undermine the protections afforded to third parties.

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251 At 60.

252 At 61.

253 At 42.

254 Chatterjee, above n 13, at 39.

255 Hebert, above n 4, at 12.

256 Chatterjee, above n 13, at 39.

257 At 40.

258 At 40.

1 Security Dilemma

As mentioned above, the due regard principle may provide a link to non-binding codes of conduct for determining fault.[259] Provided states accept this reasoning, the Liability Convention may protect third parties from the consequences of armed conflict and deter belligerents from weaponising space.[260] However, attributing liability should not require conceptual leaps, as this risks states rejecting this link between the OST and non-binding codes of conduct.

The lack of a more precise mechanism for determining fault incentivises states to protect their satellites with space weapons due to the inherent ambiguity of dual-use technology. This uncertainty encourages states to accumulate space weapon capabilities as a means of defence, increasing the uncertainty for other states and ultimately resulting in a security dilemma. The security dilemma leads to a never-ending spiral of armaments accumulation and has fuelled arms races throughout history.[261]

Inconsistent Registration

States must also register certain types of space debris; namely, their satellites' components and delivery systems. However, there are no legal sanctions for failing to register space objects and state practice in registering *active* space objects varies widely.[262] Therefore, states are unlikely to willingly register *inactive* objects such as space debris because doing so increases their liability exposure.

Moreover, art IV(1)(e) of the Registration Convention only requires registration of the space object's general function, which is open to interpretation. The level of information provided accordingly depends on the discretion of the Launching State.[263] There is also no mechanism for verifying the accuracy of information provided to the registry, exposing the system to manipulation.[264] Indeed, purely military systems are often not reported.[265] A recent illustration of the system's inadequacy is that Russia and the United States have not registered space-based weapons on the international register despite

259 Hansen, above n 43, at 45.

260 At 42.

261 Lubojemski, above n 6, at 130-131.

262 Chatterjee, above n 13, at 32.

263 At 32.

264 At 32.

265 Ram S Jakhu, Bhupendra Jasani and Jonathan C McDowell "Critical issues related to registration of space objects and transparency of space activities" (2018) 143 Acta Astronautica 406 at 411.

speculation and accusations that both countries possess these capabilities.[266] As a result, Launching States need not declare space weapons and face no repercussions for this failure.

Insufficient verification is particularly problematic given dual-use technology: Launching States may only report the space object's civilian use. Despite the extensive militarisation of outer space, no state has registered dual-use systems as having military purposes.[267] Accordingly, inconsistent registration compounds the difficulties in determining liability.

Interpretation Issues

The OST obligations are ambiguous. State Parties intended to build on the OST governance framework, but this has not yet occurred.[268]

1 "Peaceful purposes"

Peaceful can mean either non-military or non-aggressive. The debate over which meaning is used among states depends on their desired use of space.[269] For instance, the United States interpreted peaceful as non-aggressive to preserve its military and commercial interests in space. Conversely, China interpreted peaceful as non-military because it does not have a high military presence in space.[270] Ambiguity leaves room for states to reinterpret the peaceful purpose norm as their space activities change. Indeed, the debate has evolved to consider where the law draws the line between militarised and weaponised.[271]

2 Defining WMD

There is no internationally accepted definition of WMD.[272] Using the traditional description, art IV prohibits nuclear, biological, and chemical weapons, but allows all other types of space weapons. A broader definition interprets WMD as weapons capable of causing high casualties. Both definitions are problematic. The first excludes a wide range of weapons. The latter necessitates determining the number of casualties needed to classify a weapon as a WMD.[273]

266 UNOOSA "Online Index of Objects Launched into Outer Space" <www.unoosa.org>.

267 At 32; Jakhu, Jasani and McDowell, above n 265, at 411.

268 Hebert, above n 4, at 6.

269 At 6.

270 At 6-7.

271 Masson-Zwaan and Hofmann, above n 1, at 68.

272 At 19.

273 Hebert, above n 4, at 7.

3 "Place in orbit"

ICBMs carrying nuclear warheads may enter space during their trajectory and so represent a potential military use of space.[274] The OST is the paramount space treaty regulating ICBMs.[275] Whether the art IV prohibition captures these weapons depends on the interpretation of the phrase "place in orbit around the Earth".

The popular interpretation requires a complete (rather than fractional) orbit, meaning the prohibition does not apply to ICBMs.[276] The consensus is that the prohibition does not apply to WMD entering outer space on a ballistic missile trajectory.[277] However, this interpretation leaves open the question of whether an object must complete one full orbit before falling within the prohibition.[278]

Others argue a fractional orbit is sufficient for the art IV prohibition.[279] The European Space Agency defines an orbit as "the curved path that an object in space ... takes around another object due to gravity." There is no requirement for a complete revolution.[280] The term "orbit" is an umbrella term for different trajectories. Requiring a complete revolution favours an elliptical trajectory. However, there are also hyperbolic and parabolic trajectories, which similarly fall under this umbrella.[281]

Moreover, a fractional orbit entails removing the object from the original orbit in which it was placed.[282] All objects in LEO decay, meaning there is a finite point for many objects we consider in orbit under the OST. ICBMs similarly have a finite point for their orbit. Considering these characteristics and the ordinary meaning of "place in orbit", the art IV prohibition may apply to ICBMs. This interpretation is unlikely to gain traction, however, given the long-standing acceptance of the popular interpretation.[283]

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274 Lyall and Larsen, above n 1, at 519.

275 The Treaty on the Limitation of Anti-ballistic Missile Systems, Union of Soviet Socialist Republics–United States of America 944 UNTS 13 (signed 26 May 1972, entered into force 3 October 1972) ceased to be in force when the United States withdrew on 13 June 2002.

276 Bhupendra Jasani and Maria Lunderius "Peaceful uses of outer space-legal fiction and military reality" (1980) 11(1) Bulletin of Peace Proposals 57 at 66.

277 Hansen, above n 43, at 40; Lyall and Larsen, above n 1, at 519; and Taft, above n 2, at 366.

278 Stephen Gorove "Arms Control Provisions in the Outer Space Treaty: A Scrutinizing Reappraisal" (1973) 3 Ga J Int'l & Comp L 114 at 116.

279 Jasani, above n 276, at 66.

280 European Space Agency "Types of orbits" <www.esa.int>.

281 NASA History Division "Trajectories and Orbits" <www.history.nasa.gov>.

282 Jasani, above n 276, at 66.

283 At 66.

VII IMPLICATIONS FOR AOTEAROA

Multilateral laws increasingly dictate issues concerning New Zealanders;[284] the use and exploration of outer space is no exception. While domestic space law regulating space weapons compensates for the gaps in international law, Aotearoa participates in the increasing militarisation of outer space by launching satellites for foreign militaries. These launches contribute to the security dilemma and encourage the eventual weaponisation of outer space.

Treaty Status

CIL proven valid in a court is automatically incorporated into domestic common law where there is no conflicting legislation or judicial precedent.[285] Domestic courts must, however, determine whether there are any constitutional bars to incorporating CIL.[286] Still, IHL, the principle of non-aggression, and CIL aspects of the OST may bind Aotearoa irrespective of treaty status.

Comparatively, treaties do not have automatic effect in domestic law in common law countries, like Aotearoa, upon the state becoming a party.[287] Treaty-making is an executive act, but the performance of treaty obligations — if they entail changes to domestic law — requires legislative action.[288] Some treaty obligations require no modifications to domestic law, or easily achieved changes through delegated powers, to ensure Aotearoa's compliance; but other treaties require substantial changes.[289] Therefore, in practice, the executive seeks Parliament's approval to pass necessary legislation before becoming a party to a treaty.[290] However, ratification of a treaty may create a legitimate expectation that administrative decision-makers would conform to the unincorporated treaty.[291]

Aotearoa has ratified the OST, Rescue Agreement and Liability Convention.[292] Upon becoming a space-faring nation, it also acceded to the Registration Convention.[293] Aotearoa is a party to the

284 Murray, above n 38, at [8].

285 Shaw, above n 26, at 108-109 and 127.

286 At 112.

287 Murray, above n 38, at [12].

288 At [12].

289 At [14].

290 At [13], as cited in Don MacKay "The Use and Abuse of International Instruments" (NZLS Public Law Seminar, 1998).

291 Shaw, above n 26, at 128.

292 31 May 1968, 8 July 1969 and 30 October 1974, respectively.

293 23 January 2018.

PTBT, CTBT and ENMOD,[294] but not the Moon Agreement. The Geneva Conventions Act 1958 gives effect to Aotearoa's obligations under the four Geneva Conventions and the three additional protocols.

Aotearoa has further obligations relating to NW prohibitions under the South Pacific Nuclear Free Zone Treaty (Treaty of Rarotonga).[295] The Treaty of Rarotonga built upon, inter alia, the PTBT and Antarctic Treaty.[296] It prohibits State Parties from manufacturing, acquiring, possessing, controlling, encouraging the manufacture of, or giving or receiving assistance in any of these in relation to any nuclear explosive device anywhere inside or outside the Treaty zone.[297]

Propelled into Space

Fifty years after Aotearoa ratified the space treaties, Rocket Lab — a United States corporation (RLUS) with a New Zealand subsidiary (RLNZ) — became the leading commercial player in Aotearoa's emerging space industry.[298] Rocket Lab's mission is to remove commercial barriers to space by developing dedicated launch vehicles for small satellites.[299] It is estimated that over 20 years, RLNZ could contribute between $440 million and $1.55 billion to Aotearoa from its launch activities.[300]

The Aotearoa Government managed RLNZ's activities via a contract with RLUS and RLNZ until it developed the necessary laws.[301] Under the contract, the Government could veto the launch of any payload it determined was contrary to Aotearoa's law, regulations and policy; international obligations; or national security or other national interests.[302]

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294 8 August 1963, 19 March 1999 and 7 September 1984, respectively.

295 South Pacific Nuclear Free Zone Treaty 1445 UNTS 177 (opened for signature 6 August 1985, entered into force 11 December 1986) [Treaty of Rarotonga].

296 Antarctic Treaty 402 UNTS 71 (signed 1 December 1959, entered into force 23 June 1961).

297 NTI "South Pacific Nuclear-Free Zone (SPNFZ) Treaty of Rarotonga" (30 April 2018) <www.nti.org>.

298 Kirsty Hutchison and others "Managing the opportunities and risks associated with disruptive technologies: space law in New Zealand" (2017) 13(4) PQ 28 at 28-29.

299 At 29.

300 Freeland, above n 16, at 141.

301 At 142.

302 Agreement between the Minister for Economic Development and Rocket Lab Limited and Rocket Lab USA Inc (2016) at cl 3.4–3.5 (obtained under Official Information Act 1982 request to the Ministry of Business, Innovation and Employment).

RLNZ is transitioning to the relevant launch licences under the Outer Space and High-altitude Activities Act 2017 (OSHAA).[303] The transfer of sensitive technology for these launches is under a treaty-level Technology Safeguards Agreement (TSA) between Aotearoa and the United States. [304] Aotearoa's primary obligation under the TSA is ensuring that RLNZ and third parties follow its requirements. The TSA preserves Aotearoa's right to veto launches.[305]

Domestic Law

Aotearoa initially did not require legislation to discharge its obligations because it was not a space-faring nation, so there was minimal risk in ratifying the treaties.[306] However, RLNZ's emergence meant domestic legislation became necessary to ensure Aotearoa fulfilled its international obligations and managed risks associated with its space activities.[307] Moreover, obligations under the TSA necessitated domestic legislation.[308] Aotearoa consulted a wide range of industry stakeholders and evaluated the experiences of overseas jurisdictions when developing its legal framework.[309]

OSHAA came into force in December 2017 to implement international obligations relating to space activities and space technology, including under the OST.[310] OSHAA establishes both a high-altitude regime and an outer space regime.[311] To ensure the law manages risks but does not inhibit economic development,[312] OSHAA includes broad and flexible regulation-making powers.[313] The Regulations determine what a launch vehicle, payload or space object is under OSHAA. Since regulations are more amenable than legislation, the legislative design of OSHAA recognises the need to

303 MBIE "Outer space and high-altitude activities regulatory system" <https://www.mbie.govt.nz/cross-government-functions/regulatory-stewardship/regulatory-systems/outer-space-and-high-altitude-activities-regulatory-system>.

304 Agreement between the Government of New Zealand and the Government of the United States of America on Technology Safeguards Associated with United States Participation in Space Launches from New Zealand, New Zealand – United States of America, NZTS2016/14 (signed 16 June 2016, entered into force 12 December 2016).

305 Hutchison, above n 298, at 30.

306 At 29.

307 At 29.

308 At 30.

309 Freeland, above n 16, at 142.

310 Outer Space and High-altitude Activities Act 2017 [OSHAA], s 3(b)-(c).

311 Freeland, above n 16, at 143.

312 At 143.

313 MBIE "New Zealand Space Agency: Our Regulatory Regime" <www.mbie.govt.nz>. Two sets of regulations currently support OSHAA: Outer Space and High-altitude Activities (Licences and Permits) Regulations 2017; and Outer Space and High-altitude Activities (Definition of High-altitude Vehicle) Regulations 2017.

respond quickly to changing technology and international standards.[314]

Several types of licences and permits are issued under OSHAA: launch licences,[315] payload permits,[316] launch facility licences,[317] and high-altitude vehicle licences.[318] The New Zealand Space Agency (NZSA), operating under the Ministry of Business, Innovation and Employment (MBIE), is the government agency that regulates space activities and develops space policy in Aotearoa. To obtain a permit or licence, an applicant must satisfy the Minister for Economic Development that:

(a) it is technically capable of conducting a safe launch (for launch licences only);[319]
(b) it has taken and will continue to take all reasonable steps to manage the operation of the payload or launch safely;[320]
(c) it has an orbital debris mitigation plan meeting prescribed requirements;[321]
(d) the proposed operation of the payload or launch is consistent with Aotearoa's international obligations;[322] and
(e) it and the proposed operation of the payload or launch under the permit meet any other prescribed requirements.[323]

Despite these tests being satisfied, the Minister may decline a licence or permit if he or she is not satisfied that the launch or payload is in Aotearoa's national interest.[324] The Minister may weigh the economic benefits against other national interests, including national security, public safety and international relations.[325]

The Minister may also consider foreign licences when deciding whether to grant a New Zealand launch licence.[326] Authorisations granted in another country may be treated as complying with OSHAA to avoid costs and duplication.[327] Thus, applicants subject to a foreign licensing regime, like RLNZ, do not

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314 Freeland, above n 16, at 144-145.

315 Sections 7 and 23.

316 Sections 15 and 31.

317 Section 38.

318 Section 45.

319 Sections 9(1)(a), 25(1)(a), 40(1)(a) and 47(1)(a)(i).

320 Sections 9(1)(b), 17(1)(a), 25(1)(b), 33(1)(a), 40(1)(b) and 47(1)(a)(ii).

321 Sections 9(1)(c), 17(1)(c), 25(1)(c) and 33(1)(c).

322 Sections 9(1)(d), 17(1)(c), 25(1)(d), 33(1), 40(1)(c) and 47(1)(a)(iii).

323 Sections 9(1)(e), 17(1)(d), 25(1)(e), 33(1), 40(1)(d) and 47(1)(a)(iv) – (b).

324 Sections 9(2), 17(2), 25(2), 33(2), 40(2) and 47(2).

325 Sections 9(3), 17(3), 25(3), 33(3), 40(3) and 47(3).

326 Section 51.

327 Freeland, above n 16, at 144.

need to prove they have the technical capability to carry out an activity or an orbital debris mitigation plan if a competent body in another jurisdiction has conducted this assessment.[328] MBIE and NZSA expect to rely on foreign licensing regimes to determine the safety and technical competence of launch vehicles and payloads in the initial two to three years of the regime. During this period, NZSA expects to acquire the necessary technical expertise and regulatory capability.[329] Meanwhile, NZSA will still perform the national interest and security analyses.

Liability for RLNZ's Activities

Aotearoa is internationally responsible for RLNZ's activities within Aotearoa and elsewhere.[330] Moreover, Aotearoa (as the launching territory) and the United States (as the State procuring the launch), together as Launching States, are jointly and severally liable for damage resulting from RLNZ's launches.[331] Neither State can escape liability for damage, or their duties of control and supervision, by abandoning the relevant space object.[332]

1 Indemnification

Risk management under OSHAA is flexible due to the broad discretion conferred on the Minister.[333] For example, the Minister may require a licensee to indemnify the Crown against all potential international liability — including under the Liability Convention and OST — as a licence condition.[334] This flexible approach ensures that indemnity and insurance requirements are proportionate to the launch to avoid stifling innovation.[335] Indemnity and insurance clauses decrease the economic burden of space activities. However, Aotearoa's reputation as a responsible space actor remains at stake in unfavourable incidents.

328 Hutchison, above n 298, at 33.

329 At 32.

330 OST, above n 70, art VI; and Masson-Zwaan and Hofmann, above n 1, at 20. Aotearoa is the place of incorporation and therefore, must authorise and supervise RLNZ.

331 OST, above n 70, art VII; and Liability Convention, arts I(c) and V(1).

332 OST, above n 70, art VIII; and Lyall and Larsen, above n 1, at 105.

333 Freeland, above n 16, at 144.

334 Sections 10, 18, 26 and 34.

335 Hutchison, above n 298, at 33.

2 Cabinet guidelines

Cabinet approved four policy principles for space activities: sustainability, safety, responsibility and alignment with Aotearoa's values, policies, interests and laws.[336] Accordingly, it is not in Aotearoa's national interest to authorise payloads:[337]

(a) that contribute to NW programmes or capabilities;
(b) with the intended end use of harming, interfering with, or destroying other spacecraft or space systems on Earth;
(c) with the intended end use of enabling or supporting specific defence, security or intelligence operations that are contrary to government policy; or
(d) where the intended end use is likely to cause serious or irreversible harm to the environment.

These categories are not exhaustive and act only as a guide for the Minister's consideration of, and officials' advice on, national interest for payloads meeting the other mandatory tests in OSHAA.[338]

Cabinet guidelines do not have the force of law. Instead, they are statements of government policy that decision-makers observe unless there is good reason not to. Citizens may rely on the language of such policy statements, interpreted objectively in its proper context.[339] While guidelines may facilitate consistent decision-making, the decision-maker must not fetter their discretion with a fixed rule of policy.[340] They must reserve the power to depart from an adopted policy and indicate a genuine willingness to exercise it,[341] irrespective of whether a blanket policy is in the public interest.[342] However, until the decision-maker departs from the guidelines, citizens may ask the courts to determine whether a decision falls within the language of the publicly announced policy.[343] Misinterpreting or failing to apply voluntarily adopted guidelines is a reviewable error.[344]

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336 Cabinet Business Committee "Outer Space and High-altitude Activities Act 2017: Approach to Payload Assessments" (25 November 2019) CBC-19-MIN-0048 at [6].

337 At [7].

338 Office of the Minister for Economic Development "Approach to payload assessments under the Outer Space and High-altitude Activities Act" (25 November 2019) at [47].

339 *Pora v Attorney-General* [2017] NZHC 2081, 3 NZLR 683 at [106].

340 Philip A Joseph *Constitutional and Administrative Law in New Zealand* (4th ed, Brookers, Wellington, 2014) at 964 and 966.

341 At 965.

342 At 966.

343 *Pora*, above n 339, at [106].

344 Joseph, above n 340, at 952.

Based on these guidelines, Aotearoa is unlikely to approve launches of space weapons. Regardless, Aotearoa's nuclear-free policy prevents it from launching payloads with NWs.[345] However, with the rise of dual-use technologies and associated difficulties in distinguishing military and commercial uses, how may the Minister prevent the launch of assets capable of the above-mentioned end uses? This question is not easily answered, particularly considering several of the launches conducted by RLNZ were for the United States Department of Defense, including its spy agencies.[346]

Moreover, satellites launched by RLNZ may be used in any number of present and future military operations. Ministers are not fortune-tellers; they cannot predict whether applicants — particularly militaries — have disclosed all intended end uses of proposed payloads. Additionally, commercial applicants may not realise the possible end uses of their satellites, given that states may use commercial systems to support military operations as the need arises. Thus, dual-use technology renders the third category of payloads prohibited by the guidelines toothless.

Nevertheless, Aotearoa contributes to the security dilemma by approving launches of military and dual-use satellites. Satellites are inherently offensive means of increasing security as there are no geographic interceptors in space: all states are within the same range of orbiting objects. Therefore, even passive systems launched by RLNZ make an arms race in space more probable.[347]

VIII CONCLUSION

As the landscape of space exploration changes, space wars become an increasing possibility with which international law must grapple. The law must address innovative technologies and private space actors that have greater access to both space itself and space weapons. Considering increasing civilian and military reliance on space, these developments mean more actors may be willing to protect their space assets by using space weapons.

However, cumulatively applying different laws to the new space economy produces lacunae in the legal framework. These lacunae set the scene for the eventual weaponisation of outer space because the current legal framework is unclear about the extent to

345 Treaty of Rarotonga, above n 297, art 3(a).

346 Roy, above n 15.

347 Lubojemski, above n 6, at 133.

which states may militarise space. Most concerningly, nothing in the legal framework outlaws the testing of space weapons during peacetime, and four space-faring nations have already conducted such tests.

The WMD-centric treaties fail to account for future military capabilities. Moreover, it is unclear what relevance some treaty obligations have in the context of self-defence. Once war breaks out, it is similarly unclear whether the IHL restrictions apply to information weapons. Regardless, such restrictions do not apply during peacetime and do not protect exclusively military systems.

Fragmentary prohibitions — small but incomplete prohibitions from all sources of the law —mean there is no definitive legal recourse for preventing space weapon tests or attacks through the OST consultation mechanism in both wartime and peacetime. Inadequate accountability mechanisms incentivise states and private actors to take matters into their own hands. This incentive creates a security dilemma, which potentially leads to a never-ending spiral of armaments accumulation. Inadequacy aside, interpretation issues plague the obligations in the OST. Giving meaning to these treaty obligations demands internationally accepted definitions.

Aotearoa's experience exemplifies how domestic space law seeks to remedy international failings: Cabinet guidelines do more to address space weapons than the treaties. However, the guidelines lack sufficient legal force considering the potential consequences of a weaponised space. All the while, RLNZ's launches contribute to the security dilemma.

Thus, the legal framework — domestic and international — is not fit-for-purpose in preventing the weaponisation of outer space. The testing (peacetime) and potential use (wartime) of space weapons undermines space commerce and space science exploration.