8

Anti-satellite Weapons and International Law

Prohibitions on specific types of weapons can sometimes arise very quickly in international law, and with universal effect. On 22 April 1915, the German Army released 168 tonnes of chlorine gas near the Belgian city of Ypres.[1] Five thousand soldiers died in the Allied trenches that day while another 10,000 were grievously injured. Three months later, the British Army launched its own first chlorine gas attack. By the end of the First World War, chemical weapons had killed nearly 100,000 people and wounded an estimated one million.[2] After the war, these horrors prompted the negotiation of the 1925 Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare.[3] Today, the prohibition on the use of chemical weapons is regarded as a *jus cogens* rule – a customary international law 'taboo' that tolerates no exceptions, not even exceptions created by way of treaty.[4]

Compliance with the rule has not been perfect: Saddam Hussein used mustard gas against Iranian forces in the 1980s and then against Kurdish civilians in northern Iraq.[5] The international community responded with the 1992 Convention on the Development, Production, Stockpiling and

[1] David Hughes, 'Chemical weapons: The day the first poison gas attack changed the face of warfare forever', *The Independent* (28 April 2016), online: www.independent.co.uk/news/world/politics/chemical-weapons-warfare-remembrance-day-poison-mustard-gas-first-world-war-ypres-isis-a7005416.html.

[2] Ibid.

[3] Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, 17 June 1925, 94 LNTS 65 (entered into force 9 May 1926).

[4] Richard M Price, *The Chemical Weapons Taboo* (Ithaca, NY: Cornell University Press, 2007).

[5] Ibid.

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Use of Chemical Weapons and on Their Destruction.[6] Eleven years later, Saddam was removed from power by a US-led coalition that justified its actions based on allegations (which proved to be false) that Iraq was stockpiling 'weapons of mass destruction'. In the Syrian Civil War, Bashar al-Assad has used sarin gas while remaining in power, thanks to Russian support. But the general picture is clear: there is opprobrium attached to the use of chemical weapons today,[7] and to biological and nuclear weapons also. The best evidence for this is that, although the United States, Russia and China long had stockpiles of chemical weapons, they were hardly ever used, with the employment of Agent Orange in the Vietnam War and an unknown chemical in the 2002 Moscow Theatre hostage crisis being two borderline exceptions. Russia and China have both reported the destruction of their stockpiles in fulfilment of their commitments under the 1992 Chemical Weapons Convention, although the publicly voiced concerns of US officials about the possible use of chemical weapons in Ukraine suggest that some secret Russian stocks may have been retained.[8] Meanwhile, the few remaining US chemical weapons are due for elimination by September 2023.[9]

Anti-personnel landmines are another category of weapons against which a general prohibition has emerged. During the twentieth century, countless innocent civilians were killed, sometimes long after the conflicts in which they were deployed had come to an end.[10] In 1997, the Canadian government took the issue of anti-personnel landmines out of the Conference on Disarmament, where it had languished due to the consensus decision making used there. An ad hoc negotiating conference held in Ottawa produced the 1997 Convention on the Prohibition of the

[6] Convention on the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction, 3 September 1992, 1975 UNTS 45 (entered into force 29 April 1997) (Chemical Weapons Convention).

[7] The 1992 Chemical Weapons Convention has been ratified by 193 states, including China, Russia and the United States. See Organisation for the Prohibition of Chemical Weapons (OPCW), 'Member States' (2022), *OPCS*, online: www.opcw.org/about-us/member-states.

[8] Sam Fossum and Betsy Klein, 'Biden warns Russia will pay a "severe price" if it uses chemical weapons in Ukraine', *CNN* (11 March 2022), online: www.cnn.com/2022/03/11/politics/joe-biden-warning-chemical-weapons/index.html.

[9] Arms Control Association (ACA), 'Chemical and biological weapons status at a glance' (March 2022), *ACA*, online: www.armscontrol.org/factsheets/cbwprolif.

[10] Maxwell A Cameron, Robert J Lawson and Brian W Tomlin, eds., *To Walk without Fear: The Global Movement to Ban Landmines* (Toronto: Oxford University Press, 1998).

Use, Stockpiling, Production and Transfer of Anti-personnel Mines and on Their Destruction.[11] The 'Ottawa Convention' currently has 164 parties, although the United States, Russia and China are not among them.[12] The lack of ratifications or accessions by these militarily powerful states was readily foreseeable at the time of the negotiations; what was perhaps not as foreseeable was that the use of anti-personnel landmines has declined markedly in the past two decades, including among non-parties to the Ottawa Convention (although not, it would seem, Russia in Ukraine).[13] For international lawyers, this development is not a huge surprise, since the conclusion of multilateral treaties often leads to state practice, evidence of *opinio juris* (i.e. sense of legal obligation), and the consequent development of parallel rules of customary international law.[14] Even in the absence of a binding new rule, a change in a community's view of the ethical acceptability of an action can have powerful behavioural consequences.

Weapons that cause indiscriminate and long-lasting harm have also been tested in Space, including – as discussed in the previous chapter – nuclear devices as anti-ballistic-missile weapons. These weapons have, in turn, prompted efforts to prohibit or limit their testing and use. The 1962 discovery that nuclear explosions in Space threaten all satellites created momentum for the negotiation of the Limited Test Ban Treaty the very next year.[15]

A second indiscriminate threat to satellites was identified in the 1970s in the form of orbital debris, including the Kessler–Cour-Palais syndrome of knock-on collisions discussed in the previous chapter. As we also saw in that chapter, kinetic ASAT weapon tests – i.e. tests of anti-satellite weapons that rely on violent impacts – have contributed to the

[11] Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-personnel Mines and on Their Destruction, 18 September 1997, 2056 UNTS 211 (entered into force 1 March 1999) (Ottawa Convention).

[12] Anti-personnel Mine Ban Convention, 'Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-personnel Mines and on Their Destruction – Membership' (2018), online: new.apminebanconvention.org/en/membership.

[13] Adam Bower, *Norms without the Great Powers: International Law and Changing Social Expectations in World Politics* (Oxford: Oxford University Press, 2017).

[14] Bing Bing Jia, 'The relations between treaties and custom' (2010) 9:1 *Chinese Journal of International Law* 81.

[15] Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water, 5 August 1963, 480 UNTS 43 (entered into force 10 October 1963) (Limited Test Ban Treaty).

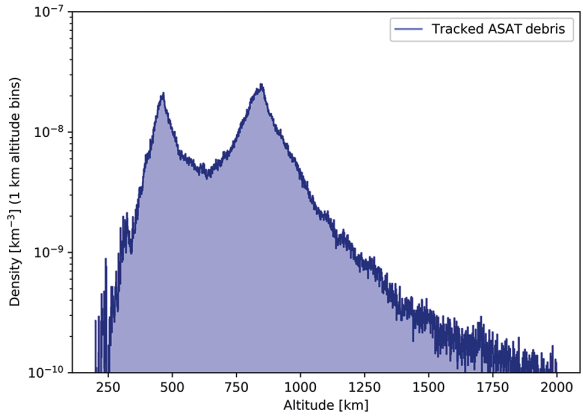

Figure 8.1 Density of debris in orbit as of 27 January 2022 due to ASAT weapon tests. While a number of tests contribute to the structure, the shape is dominated by two distinct events: the Russian 2021 and the Chinese 2007 weapon tests at about 480 kilometres and 850 kilometres respectively. The densities are determined using methods similar to those used for Figures 2.2 and 2.3 in Chapter 2. ASAT weapon test debris contributes a large fraction of the total on-orbit debris.

debris crisis in low Earth orbit (LEO). Indeed, as of February 2022, approximately 2,850 trackable pieces remain in orbit from the most significant of these events, a Chinese test in 2007. Another major injection of debris occurred after the November 2021 Russia test (See Figure 8.1).

ASAT weapons are now regarded as a major threat to the exploration and use of Space, including the communications and Earth-imaging provided by military satellites. As a result, international momentum towards negotiations on a kinetic ASAT weapon test ban treaty has been growing. However, that is not the only way in which a ban could come into being. Two distinct but related strands of legal development will be examined in this chapter.

The first considers whether a test ban already exists, or might soon develop, as the result of a reinterpretation of the Outer Space Treaty. The accepted interpretation of Article I, second paragraph, of the Outer Space Treaty may be evolving as a result of the changing practice of the parties to that treaty. In short, many states are behaving as if ASAT weapon tests that create long-lasting debris are contrary to the 'freedom of exploration and use of space'. For this reason, we will end up concluding that the accepted interpretation of this second paragraph of Article I is indeed changing.

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Figure 8.2 Defence Research and Development Organisation ballistic missile defence interceptor being launched for ASAT weapon test in March 2019. Photograph credit: Government of India.

The second strand, emerging from the same practice and an accompanying *opinio juris* may be the development of a parallel rule of customary international law. Ultimately, our analysis leads us to the conclusion that this change, too, is now under way.

Before we embark on this analysis, it is important to note that the *use* of ASAT weapons, as opposed to their *testing*, is governed by two further, separate bodies of international law. These are the *jus ad bellum* governing the recourse to armed force, which includes self-defence, and the *jus in bello* governing the conduct of armed conflict itself. The *jus ad bellum* and the *jus in bello* will be discussed towards the end of this chapter, where we conclude that any use of a kinetic ASAT weapon in armed conflict would be illegal today because of the growing crisis of Space debris. This chapter

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does not consider the legality of *possessing* ASAT weapons, because many potential ASAT weapons are dual-use. Indeed, a spacecraft designed to retrieve defunct satellites and other Space debris could also be used to destroy or disable another active satellite.

8.1 Kinetic ASAT Weapon Tests and the Outer Space Treaty

The freedom of exploration and use of Space began as a rule of customary international law, developing shortly after the 1957 launch of Sputnik when other states acquiesced to having their territory overflown by the Soviet satellite.[16] The launch the following year of the first American satellite was met with a similarly passive and therefore permissive response. The freedom of exploration and use of Space was then made central to two landmark United Nations General Assembly resolutions adopted in 1961 and 1963. Resolution 1721 (XVI) stated, 'Outer space and celestial bodies are free for exploration and use by all States in conformity with international law . . .'.[17] The subsequent Resolution 1962 (XVIII) similarly stated, 'Outer space and celestial bodies are free for exploration and use by all States on a basis of equality and in accordance with international law.'[18] States were so quick to accept these two resolutions as reflective of customary international law that Bin Cheng coined the term 'instant customary international law'.[19]

When the Outer Space Treaty was adopted in 1967, it included as the second paragraph of Article I,

> Outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind,

[16] Eugène Pépin, 'Legal problems created by the Sputnik' (1957) 4 *McGill Law Journal* 66 at 67; Anthony D'Amato, *The Concept of Custom in International Law* (Ithaca, NY: Cornell University Press, 1971) at 89; Stuart Banner, *Who Owns the Sky? The Struggle to Control Airspace from the Wright Brothers On* (Cambridge, MA: Harvard University Press, 2008) at 278–79.

[17] *International Co-operation in the Peaceful Uses of Outer Space*, GA Res 1721 (XVI), UNGAOR, 16th Sess, 1085th Plen Mtg, UN Doc A/RES/1721(XVI) (1961) at para. 1(b).

[18] *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, GA Res 1962 (XVIII), UNGAOR, 18th Sess, 1280th Plen Mtg, UN Doc A/RES/1962(XVIII) (1963) at para. 2.

[19] Bin Cheng, 'United Nations resolutions on outer space: "Instant" international customary law?' (1965) 5 *Indian Journal of International Law* 23.

> on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.[20]

Most rights or freedoms exist together with obligations. In this case, the obligation is to not interfere with other states' exploration and use of Space. This obligation of non-interference is recognised and supported by Article IX of the Outer Space Treaty, the first sentence of which reads,

> In the exploration and use of outer space, including the moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of co-operation and mutual assistance and shall conduct all their activities in outer space, including the moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty.

The rest of Article IX sets out a duty to consult, which helps to protect the freedom of exploration and use by ensuring that states do not carry out insufficiently informed actions that might interfere with this shared freedom. Responses to possible violations of Article I, second paragraph, sometimes focus on a failure to consult in advance of the problematic behaviour,[21] perhaps because it is easier to establish an absence of consultation than it is to establish a violation of the obligation of non-interference. In any event, it is important to treat the duty to consult as separate from the freedom of exploration and use (and the related obligation of non-interference), with the latter constituting the primary obligation of the two.

The Outer Space Treaty was negotiated and adopted before the risk of Space debris was understood, and before Donald Kessler and Burton Cour-Palais clearly described the risk of knock-on collisions in 1978.[22] Yet treaty obligations designed for general application can and often do apply to specific issues that emerge at later times. For example, there is no question that the provisions of the 1945 United Nations Charter that

[20] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, 27 January 1967, 610 UNTS 205 Art. I (entered into force 10 October 1967) (Outer Space Treaty).

[21] In an article written just after the 2007 Chinese ASAT test, Michael Mineiro focused on the duty to consult and US, Russian and Chinese failures in that regard, concluding that Article IX was weakened but still operative. Michael C Mineiro, 'FY-1C and USA-193 ASAT intercepts: An assessment of legal obligations under Article IX of the Outer Space Treaty' (2008) 34:2 *Journal of Space Law* 321.

[22] Donald J Kessler and Burton G Cour-Palais, 'Collision frequency of artificial satellites: The creation of a debris belt' (1978) 83:A6 *Journal of Geophysical Research: Space Physics* 2637.

prohibit the use of force (Article 2(4)) while allowing for a right of self-defence (Article 51) apply to modern cyber attacks.[23]

We therefore need to consider how the freedom of exploration and use of Space as set out in the second paragraph of Article I of the Outer Space Treaty is being interpreted and applied to kinetic ASAT weapon testing. Doing so requires not only a careful assessment of the 'subsequent practice' of the parties in conducting ASAT weapon tests – the Chinese in 2007, the Indians in 2019 and the Russians in 2021 – but also what those states said, the international responses to them, and the avoidance of actual strikes during other, similar tests.[24]

This subsequent practice is relevant because of Article 31 of the 1969 Vienna Convention on the Law of Treaties,[25] which reads,

1. A treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose.
2. The context for the purpose of the interpretation of a treaty shall comprise, in addition to the text, including its preamble and annexes:
   (a) any agreement relating to the treaty which was made between all the parties in connexion with the conclusion of the treaty;
   (b) any instrument which was made by one or more parties in connexion with the conclusion of the treaty and accepted by the other parties as an instrument related to the treaty.
3. There shall be taken into account, together with the context:
   (a) any subsequent agreement between the parties regarding the interpretation of the treaty or the application of its provisions;
   (b) *any subsequent practice in the application of the treaty which establishes the agreement of the parties regarding its interpretation*;
   (c) any relevant rules of international law applicable in the relations between the parties.

[23] Khatuna Burkadze, 'A shift in the historical understanding of armed attack and its applicability to cyberspace' (2020) 44:1 *Fletcher Forum of World Affairs* 33.

[24] The US Navy's use of a ship-based missile to destroy a re-entering satellite in 2008 is also discussed below, though it remains uncertain whether that strike was a test or, as the United States claimed, motivated by safety and environmental concerns.

[25] Although the 1969 Vienna Convention on the Law of Treaties does not apply retrospectively to the 1967 Outer Space Treaty, its provisions are generally treated as codifying pre-existing customary international law regarding treaty interpretation. See Richard K Gardiner, *Treaty Interpretation*, 2nd ed. (Oxford: Oxford University Press, 2015) 477.

4. A special meaning shall be given to a term if it is established that the parties so intended.[26]

For present purposes, the relevant provision is Article 31(3)(b) (which we have italicised) since there are no agreements (2(a)) or instruments (2 (b)) or subsequent agreements (3(a)) of relevance here.

It should be noted that all of this 'subsequent practice' will also constitute 'state practice' as well as potential evidence of '*opinio juris*' – the objective and subjective elements of customary international law. As a result, the review of practice in which we are about to engage – regarding the interpretation of the second paragraph of Article I of the Outer Space Treaty – will also enable us to consider, in the second part of this chapter, whether a prohibition on kinetic ASAT weapon testing is also developing as a rule of customary international law.

To save readers a great deal of repetition, we do *not* conduct two separate reviews of practice. Instead, in this first part we review the 'subsequent practice' for the purposes of treaty interpretation. We then refer to this review in the next part, which addresses the 'state practice' and *opinio juris* elements of customary international law. We can take this approach because almost all the spacefaring states, and all the major spacefaring states, are parties to the Outer Space Treaty. Nearly all the relevant practice is therefore both subsequent practice and state practice.

8.1.1 Kinetic ASAT Weapon Tests This Century

As soon as the first satellites were placed into orbit, states began exploring how to destroy them, with the first kinetic ASAT weapon test taking place as early as 1959. These efforts were led by the United States and the Soviet Union, with China and India following in the 2000s. A comprehensive list of ASAT weapon tests, made available by the Secure World Foundation, is worth taking time to review online.[27]

Several things can be learned from the Secure World Foundation list. First, most ASAT weapon tests have generated no Space debris, mainly because they were conducted without a physical target. Second, those that have involved strikes on physical targets have generated debris, and in

[26] Vienna Convention on the Law of Treaties, 23 May 1969, 1155 UNTS 331 Art. 31 (entry into force 27 January 1980).

[27] Secure World Foundation, 'History of ASAT Tests in Space' (2022), *Google Docs*, online: docs.google.com/spreadsheets/d/1e5GtZEzdo6xk41i2_ei3c8jRZDjvP4Xwz3BVsUHwi48/edit#gid=0.

doing so have had a lasting impact on the orbital environment. Third, single events, such as the 2007 Chinese ASAT weapon test, can create substantial changes to the debris population. Fourth, the cumulative effects of multiple events can also be serious and long-lasting. Indeed, there are about as many fragments from Soviet-era ASAT weapon tests still in orbit today as there are fragments added by the November 2021 Russian ASAT test. And when those two debris populations are added together, they are comparable in number to that produced by the 2007 Chinese test, the single worst debris-generating event of all time.

As states have become aware of the long-term Space debris created by ASAT weapon tests, and the associated hazards, opposition to those tests that involve physical strikes has also begun to grow.

8.1.2 Responses to the 2007 Chinese ASAT Weapon Test

The 2007 Chinese test was the first strike by a kinetic ASAT weapon in more than two decades.

It could be argued that the debris-creating test, as a prominent instance of 'subsequent practice', confirmed and thus bolstered an interpretation of the Article I, second paragraph, freedom of exploration and use that allows for such testing. But an examination of the international response to the test leads to a different conclusion.

Any assessment of subsequent practice associated with an ASAT weapon test must also include the responses from other treaty parties because, in accordance with Article 31(3)(b) of the Vienna Convention on the Law of Treaties, we are looking for 'any subsequent practice in the application of the treaty *which establishes the agreement of the parties* regarding its interpretation' (emphasis added). No single act, such as a missile strike, can establish an agreement of the parties. Taken collectively, the responses to the Chinese test reveal that (1) states are concerned about the creation of long-lasting Space debris; (2) some states consider the deliberate creation of long-lasting debris to be illegal; (3) no state, not even China, is willing to assert that the deliberate creation of long-lasting debris is legal.

The response of the United States unfolded over several stages, first in public and then behind closed doors. Immediately after the Chinese test, US National Security Council spokesperson Gordon Johndroe stated, 'The United States believes China's development and testing of such weapons is inconsistent with the spirit of cooperation that both countries

aspire to in the civil space area. We and other countries have expressed our concern to the Chinese.'[28]

Later, once it became clear just how much debris had been created, the US embassy in Beijing was instructed to make a *démarche* to the Chinese government based on a set of 'talking points' to be left with the Chinese as a 'non-paper'. For the purposes of this chapter, the relevant talking points listed in this deliberately unofficial document were:

- Debris from China's ASAT test has increased hazards to other peaceful uses of space in low earth orbit by the United States and other space-faring nations.
- This is a very serious matter for the entire international community.
- Unfettered access to space and the capabilities provided by satellites in orbit are vital to United States national and economic security.
- The United States considers space systems to have the rights of unhindered passage through, and operations in, space without interference.[29]

The last of these talking points shows the United States expressing the view that kinetic ASAT weapon tests impede the freedom of exploration and use of Space when they create long-lasting debris.

Japan came to the same conclusion, with Prime Minister Shinzo Abe stating that the Chinese test violated the Outer Space Treaty, though he did not indicate which specific article had been contravened.[30] Foreign Minister Taro Aso warned of the danger from debris, saying, 'I doubt if we could call this a peaceful use.'[31] The European Union also cited the Outer Space Treaty when urging the Chinese to 'abide by their commitment to exercise their Space activities in accordance with international law'.[32] Madhavan Nair, the chair of the Indian Space Research Organisation,

[28] William J Broad, David E Sanger and Joseph Kahn, 'Missile test puts China on path to militarizing space', *New York Times* (19 January 2007), online: www.nytimes.com/2007/01/19/world/asia/19iht-china.4269526.html.

[29] United States Secretary of State, diplomatic cable, 'Second demarche for China regarding China's January 2007 anti-satellite test' (6 January 2007), *WikiLeaks*, online: wikileaks.org/plusd/cables/08STATE1264_a.html.

[30] Carin Zissis, 'China's anti-satellite test' (22 February 2007), *Council on Foreign Relations*, online: www.cfr.org/backgrounder/chinas-anti-satellite-test.

[31] Broad, Sanger and Kahn, op. cit. (citing the Japanese newspaper *Asahi Shimbun*).

[32] Council of the European Union, press release, 5602/1/07 REV1 (Presse 10), 'Declaration by the presidency on behalf of the European Union on a Chinese test of an anti-satellite weapon' (24 January 2007), online: www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/cfsp/92512.pdf.

similarly stated that China 'should not have done this as it goes against international convention'.[33]

Other states expressed alarm at the Chinese ASAT weapon test without expressing any specific legal concerns, and these statements, while still relevant, therefore count for less in our legal analysis than the ones above. Australian foreign minister Alexander Downer said his country was 'concerned about the militarisation of outer space on the one hand and secondly concerned about the impact that debris from destroyed satellites could have on other satellites, which are very expensive pieces of equipment'.[34] Canada 'expressed its strong concerns to the Chinese authorities over the reported anti-satellite test and the possible negative effects'.[35] A spokesperson for the United Kingdom said, 'We are concerned about the impact of debris in space and we expressed that concern.'[36]

For the purposes of a complete analysis, it should be noted that several states responded to the Chinese ASAT weapon test without addressing the legal or Space debris issues. Russian deputy prime minister Sergei Ivanov stated, 'The use of outer space for security and defense purposes is one thing, and the placement of weapons there is quite another. The latter is absolutely unacceptable in our view, as it makes the global security situation unpredictable.'[37] Since the Chinese test was conducted with a ground-based missile, Ivanov's comment was somewhat off-point. It was, however, soon supplemented by a public acknowledgement of the risks posed by Space debris and knock-on collisions by scientists from the

[33] Joseph E Lin, 'Regional reactions to ASAT missile test & China's renewed activities in the East China Sea' (17 October 2007), *Jamestown Foundation*, online: jamestown.org/program/regional-reactions-to-asat-missile-test-chinas-renewed-activities-in-the-east-china-sea.

[34] Agence France-Presse, 'Australia summons China envoy over satellite', *Space Daily* (19 January 2007), online: www.spacedaily.com/reports/Australia_Summons_China_Envoy_Over_Satellite_999.html.

[35] Geoffrey York, 'China's anti-satellite weapon fuels anxiety', *Globe and Mail* (22 January 2007), online: www.theglobeandmail.com/news/world/chinas-anti-satellite-weapon-fuels-anxiety/article677375.

[36] Richard Spencer, 'Chinese missile destroys satellite in space', *The Telegraph* (19 January 2007), online: www.telegraph.co.uk/news/worldnews/1539948/Chinese-missile-destroys-satellite-in-space.html.

[37] 'Russia opposes militarizing space', *United Press International* (6 February 2007), online: www.upi.com/Defense-News/2007/02/06/Russia-opposes-militarizing-space/77401170778644.

Russian Space Agency, who, in 2009, made a presentation which included the following verbatim text:

> Man-made orbital debris poses an increasing risk to space vehicles
>
> - The time have come when space debris poses the real risk for long term sustainable space activity, also for people safety and property on the Earth surface.
> - Each following launch of a space vehicle at long last leads to creation of new space debris. Moreover, studies indicate that beyond the middle of current century the self-collision fragments will outnumber decaying debris, and force the total debris population to increase.
> - Taking into account that space have got more deeply in all fields of activity of states and individuals, any limitation of space activity can lead to negative influence on economy of states and international relations up to development of potential conflicts.
> - So, space debris problem that have to be decided, concerns not only aspects of space engineering and space technologies, but also affects the social and economic development of states and their national security.[38]

China eventually responded to the concerns expressed by other states and did so in a conciliatory manner. Foreign Ministry spokesperson Liu Jianchao said, 'China consistently advocates peaceful utilization of the outer space, and opposes to weaponization of arms race in the outer space. Neither has China has participated, nor will it participate in arms race of the outer space in any form.'[39] Some observers believe that the Chinese government had underestimated the negative responses the ASAT weapon test would generate, because of the lack of protests after previous debris-creating tests conducted by the United States and Soviet Union during the 1970s and 1980s.[40] Others believe that the People's Liberation Army conducted the test without first securing the agreement of the Chinese Foreign Ministry or fully informing the

[38] Yuriy Makarov, Dmitriy Gorobets and Michael Yakovlev, 'Space debris and challenges to safety of space activity' (presentation delivered at the International Interdisciplinary Congress on Space Debris, Montreal, 7–9 May 2009), online: www.mcgill.ca/iasl/files/iasl/Session_3_Michael_Yakovlev.pdf.

[39] Liu Jianchao, 'Foreign Ministry spokesperson Liu Jianchao's regular press conference on 23 January 2007' (24 January 2007), *Embassy of The People's Republic of China in the United States of America*, online: http://toronto.china-consulate.gov.cn/eng/fyrthhz/lxjzzdh/200701/t20070124_7253368.htm.

[40] Phillip C Saunders and Charles D Lutes, 'China's ASAT test: Motivations and implications' (2007) 46 *Joint Force Quarterly* 39.

Chinese leadership about the likely creation of large amounts of Space debris.[41] Significantly, China did not respond to the concerns of other states by asserting that it had a legal right to test ASAT weapons in an unrestricted manner.

8.1.3 *Changes in Practice after the 2007 Chinese ASAT Weapon Test*

After the 2007 Chinese ASAT weapon test, which revealed that even a single kinetic weapon can create tens of thousands of pieces of Space debris, subsequent tests were conducted in ways that sought to avoid creating long-lasting debris. In 2008, when the United States employed a missile defence interceptor to destroy a malfunctioning satellite,[42] it did so at a very low altitude.[43] It also justified its action on the basis that the satellite was about to re-enter the atmosphere with a large amount of highly toxic hydrazine thruster fuel on board.[44] For these reasons, and despite some observers speculating that the US action was a response to the 2007 Chinese test,[45] it did not attract protests from other states.

In 2013, China tested a missile by directing it to 'nearly geosynchronous orbit'.[46] However, no attempt was made to strike a satellite, in an apparently deliberate effort to avoid creating Space debris. Then, in 2014, China conducted a missile defence test that would have contributed to its ASAT capabilities.[47] However, the missile-to-missile impact took place at a very low altitude.

Since 2007, in China and elsewhere, most ASAT development efforts have focused on highly manoeuvrable spacecraft designed to nudge or pull satellites off course, as well as non-kinetic technologies such as lasers,

[41] Bates Gill and Martin Kleiber, 'China's space odyssey: What the antisatellite test reveals about decision-making in Beijing' (May/June 2007) 86:3 *Foreign Affairs* 2; Saunders and Lutes, op. cit. at 40 ('The unco-ordinated Chinese response suggests that the Ministry of Foreign Affairs (MFA) was not aware of the January ASAT test in advance').

[42] 'US missile hits spy satellite', *New Scientist* (21 February 2008), online: www.newscientist.com/article/dn13359-us-missile-hits-spy-satellite.

[43] Lee Billings, 'War in space may be closer than ever', *Scientific American* (10 August 2015), online: www.scientificamerican.com/article/war-in-space-may-be-closer-than-ever.

[44] Thom Shanker, 'Pentagon is confident missile hit satellite tank', *New York Times* (21 February 2008), online: www.nytimes.com/2008/02/21/us/21cnd-satellite.html.

[45] Karanpreet Kaur, 'China's anti-satellite warfare programme: Implications and lessons' (Spring 2014) *Scholar Warrior* 112.

[46] Harsh Vasani, 'How China is weaponizing outer Space', *The Diplomat* (1 January 2017), online: thediplomat.com/2017/01/how-china-is-weaponizing-outer-space.

[47] Ibid.

jammers and cyber actions.[48] None of these methods or technologies contributes directly to the creation of Space debris. However, it is possible that a redirected satellite could incidentally collide with another satellite or with debris, while a satellite subject to a cyber action might be permanently disabled and thus transformed into a substantial piece of long-lived Space debris.

The Space debris crisis is motivating some spacefaring states and companies to include technologies in satellites that allow them to be de-orbited at the end of their operational lives or boosted to sparingly used 'graveyard' orbits. 'Active debris removal' is also the subject of considerable research. In October 2021, China launched the *Shijian-21* spacecraft, which two months later docked with the defunct Beidou-2 G2 navigation satellite in geosynchronous Earth orbit (GEO), about 36,000 kilometres above the equator. In January 2022, *Shijian-21* performed an engine burn which raised its altitude – and that of the defunct satellite – by about 3,000 kilometres.[49] *Shijian-21* then undocked and returned to GEO, leaving Beidou-2 G2 behind in a very high graveyard orbit. Although the Chinese spacecraft is clearly 'dual-use' technology, its employment to remove a defunct satellite from a crowed orbit demonstrates China's concern about Space debris.[50]

The European Space Agency is also testing methods to de-orbit derelict satellites and other Space debris. In 2025, it will launch a spacecraft named *ClearSpace-1* equipped with four robotic arms to experimentally capture a piece of debris—a 100-kilogram payload adapter left in an 800 × 660-kilometre orbit following the launch of an ESA remote-sensing satellite

[48] See Billings, op. cit; David A Koplow, *Death by Moderation: The U.S. Military's Quest for Useable Weapons* (Cambridge: Cambridge University Press, 2009) at 168–72; Madeleine Moon, 'The space domain and allied defence' (8 October 2017), NATO Parliamentary Assembly Defence and Security Committee, Report 162 DSCFC 17 E rev.1 fin at 6-8, online: www.nato-pa.int/document/2017-space-domain-and-allied-defence-moon-report-162-dscfc-17-e-rev1-fin.

[49] Andrew Jones, 'China's Shijian-21 towed dead satellite to a high graveyard orbit', *SpaceNews* (27 January 2022), online: spacenews.com/chinas-shijian-21-spacecraft-docked-with-and-towed-a-dead-satellite/.

[50] A related technological effort involves 'on-orbit servicing'. US-based Northrop Grumman has twice conducted test dockings of its 'Mission Extension Vehicle' with satellites operated by Intelsat. Once fully operational, the technology will be used to refuel satellites in geosynchronous orbit, thus extending their operational lives. Northrop Grumman, 'SpaceLogistics: Our life extension services' (2022), online: www.northropgrumman.com/space/space-logistics-services.

in 2013.[51] NASA too has similar research projects under way.[52] All of these measures indicate a fast-growing concern about collisions that lead to Space debris, and thus contribute to developing a prohibition on ASAT weapon testing that creates long-lasting debris, as a matter both of treaty reinterpretation and, as we will see later, of customary international law.

8.1.4 *Debates and Decisions within Intergovernmental Organisations*

Recent debates within intergovernmental organisations demonstrate widespread concern about kinetic ASAT weapon tests that create long-lasting debris as well as growing support for a ban. Some of these statements constitute subsequent practice in support of a reinterpretation of the second paragraph of Article I of the Outer Space Treaty, as well as state practice and evidence of *opinio juris* for the purposes of customary international law, as discussed below. Decisions taken by intergovernmental organisations can also constitute subsequent practice, as well as state practice and evidence of *opinio juris*, on the part of their member states, even if the decisions are not themselves legally binding – as with United Nations General Assembly resolutions.[53] This is particularly the case in the Space context, where all spacefaring states are members of both the General Assembly and the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). Nearly all of them are also parties to the Outer Space Treaty, which explicitly refers to its parties undertaking Space activities within the framework of international organisations.[54] Finally, decisions taken by international organisations can prompt states to engage in legally relevant subsequent practice beyond the framework of those organisations, with this practice also

[51] ClearSpace Today, 'Shaping sustainability beyond Earth' (2022), online: clearspace.today; Samantha Matthewson, 'ESA partners with startup to launch first debris removal mission in 2025', *Space.com* (16 May 2021), online: www.space.com/esa-startup-clearspace-debris-removal-2025.

[52] NASA Astromaterials Research & Exploration Science, 'Orbital Debris Program Office' (2022), *NASA*, online: orbitaldebris.jsc.nasa.gov.

[53] Following the report of a working group of the International Law Commission into the 'Identification of customary international law', the UN General Assembly in 2018 adopted Resolution 73/203 which found, 'In certain cases, the practice of international organizations also contributes to the formation, or expression, of rules of customary international law'. *Identification of Customary International Law*, GA Res 73/203, UNGAOR, 73rd Sess, 62nd Plen Mtg, UN Doc A/RES/73/203 (2018).

[54] Outer Space Treaty, op. cit., Arts. VI, XIII.

constituting state practice as well as, perhaps, evidence of *opinio juris*. An example is a state taking the guidelines adopted by an intergovernmental organisation and making them part of its domestic law.

This is exactly what occurred after COPUOS adopted seven Space Debris Mitigation Guidelines in 2007, including this guideline (their fourth):

> Recognizing that an increased risk of collision could pose a threat to space operations, the intentional destruction of any on-orbit spacecraft and launch vehicle orbital stages or other harmful activities that generate long-lived debris should be avoided. When intentional break-ups are necessary, they should be conducted at sufficiently low altitudes to limit the orbital lifetime of resulting fragments.[55]

Since COPUOS operates on a consensus basis, the guidelines were supported by all of its then 67 member states, which included almost all the spacefaring states (except for Israel, which joined COPUOS in 2015).[56] This support is subsequent practice for the purposes of treaty interpretation (and state practice for the purposes of customary international law). Then, when the UN General Assembly endorsed the Space Debris Mitigation Guidelines later in 2007, it stated that the guidelines themselves 'reflect the existing practices as developed by a number of national and international organizations'.[57]

Now this is where things get interesting: China responded to the Space Debris Mitigation Guidelines by immediately adopting Space debris mitigation requirements for all Chinese entities engaged in Space activities.[58] Then, in 2009, it released domestically binding Interim Measures on Space Debris Mitigation and Protective Management with the aim, according to Yun Zhao, 'of guaranteeing the normal operation of spacecraft and protection of the Space environment'.[59]

[55] United Nations Office for Outer Space Affairs (UNOOSA), *Space Debris Mitigations Guidelines of the Committee on the Peaceful Uses of Outer Space* (Vienna: United Nations, 2010), guideline 4, online: www.unoosa.org/oosa/oosadoc/data/documents/2010/stspace/stspace49_0.html.

[56] If one considers spacefaring states as those which have launched orbital spacecraft, currently North Korea (which achieved orbital launch capability in 2012) is the only spacefaring state that is not also one of the now 102 members of COPUOS.

[57] *International Co-operation in the Peaceful Uses of Outer Space*, GA Res 62/217, UNGAOR, 62nd Sess, 79th Plen Mtg, UN Doc A/RES/62/217 (2007) at para. 27.

[58] Yun Zhao, *National Space Law in China* (Leiden: Brill Nijhoff, 2015) at 218.

[59] Ibid. at 220.

Russia introduced its own General Requirements on Space Systems for the Mitigation of Human-Produced Near-Earth Space Pollution in 2008. These requirements, which are binding in Russian domestic law, are explicitly based on the UN Space Debris Mitigation Guidelines.[60]

Prior to this, in 1995, NASA was the first Space agency to issue a set of orbital debris mitigation guidelines. Then, in 2001, the binding Orbital Debris Mitigation Standard Practices (ODMSP) became the principal debris-related requirements applicable to all Space activities under the supervision and control of the US government.[61] The ODMSP influenced both the subsequent Space debris mitigation guidelines of COPUOS in 2007 and the Inter-Agency Space Debris Coordination Committee (IADC) in 2002.[62] They were updated by the US government in November 2019,[63] a development that could potentially spur updates to these multilateral guidelines in the years ahead.

Australia's 2018 Space (Launches and Returns) Act includes as a launch requirement a Space debris mitigation strategy, which must be based on internationally recognised standards or guidelines, such as those of COPUOS and the IADC.[64] Similarly, the Space debris mitigation requirements of Canada's 2007 Remote Sensing Space Systems Regulations are consistent with both the COPUOS and IADC Space debris mitigation guidelines, with the Canadian Space Agency adopting the latter in 2012 as directly applicable to all its operations.[65]

The IADC, noted above, was created even earlier, in 1993, to coordinate efforts to deal with orbital debris. It is currently made up of

[60] Russian Federation, 'National standard of the Russian Federation GOSTR52925–2008', cited in Y Makarov, G Raykunov, S Kolchin, S Loginov, M Mikhailov and M Yakovlev, 'Russian Federation activity on space debris mitigation', Federal Space Agency of Russia (2010), online: www.tsi.lv/sites/default/files/editor/science/Conferences/SPACE/makarov.pdf.

[61] NASA Orbital Debris Program Office, 'Debris mitigation' (2022), *NASA*, online: orbitaldebris.jsc.nasa.gov/mitigation.

[62] Michael P Gleason, 'A short guide for understanding and assessing US space sustainability initiatives' (April 2021), *Center for Space Policy and Strategy*, online: aerospace.org/sites/default/files/2021-04/Gleason_SpaceSustainability_20210407.pdf.

[63] NASA, 'US government orbital debris mitigation standard practices, November 2019 update' (2019), *NASA*, online: orbitaldebris.jsc.nasa.gov/library/usg_orbital_debris_mitigation_standard_practices_november_2019.pdf.

[64] UNOOSA, 'Compendium: Space debris mitigation standards adopted by states and international organizations' (17 June 2021), *UNOOSA*, online: www.unoosa.org/documents/pdf/spacelaw/sd/Space_Debris_Compendium_COPUOS_17_june_2021.pdf at 8–9.

[65] Ibid. at 16–19.

representatives from the European Space Agency and 12 national Space agencies, including those of the United States, Russia, China and India. In 2002, and again (with small revisions) in 2007, 2020 and 2021, the IADC adopted a set of its own Space Debris Mitigation Guidelines.[66] Guideline 5.2.3 on the 'Avoidance of intentional destruction and other harmful activities' reads,

> Intentional destruction of a spacecraft or orbital stage, (self-destruction, intentional collision, etc.), and other harmful activities that may significantly increase collision risks to other spacecraft and orbital stages should be avoided. For instance, intentional break-ups should be conducted at sufficiently low altitudes so that orbital fragments are short lived.

The International Organization for Standardization (known as the ISO) is an international non-governmental organisation with 165 members – all of them national standards bodies, some of which are closely connected to governments, others of which are not.[67] In 2010 the ISO adopted a stringent set of Space Debris Mitigation Requirements which apply to all unmanned satellites and spacecraft 'launched into, or passing through, near-Earth space'.[68] These requirements were updated by the ISO the following year and are 'intended to reduce the growth of space debris by ensuring that spacecraft and launch vehicle orbital stages are designed, operated and disposed of in a manner that prevents them from generating debris throughout their orbital lifetime'.[69] Among other things, all new satellites must be able to de-orbit to Earth, or boost themselves into graveyard orbits at the end of their lifespan.

The ISO Space Debris Mitigation Requirements are not legally binding. However, in 2015 they were adopted by the European Cooperation for Space Standardization, an initiative, led by the 22 member-state European Space Agency (ESA), that seeks to develop a coherent, single set of user-friendly standards for use in all European

[66] Inter-Agency Space Debris Coordination Committee (IADC), 'Space Debris Mitigation Guidelines – third revision' (2021), *IADC*, online: https://www.iadc-home.org/documents_public/file_down/id/5249.

[67] International Organization for Standardization (ISO), 'About us' (2022), *ISO*, online: www.iso.org/about-us.html.

[68] ISO, 'ISO 24113:2010, Space systems – Space debris mitigation requirements' (July 2010), *ISO*, online: www.iso.org/standard/42034.html.

[69] ISO, 'ISO 24113:2011, Space systems – Space debris mitigation requirements' (May 2011), *ISO*, online: www.iso.org/standard/57239.html.

Space activities.[70] The standards adopted by the European Cooperation for Space Standardization are applied to all ESA projects,[71] a step which constitutes both state practice and perhaps also evidence of *opinio juris* – not on the banning of kinetic ASAT weapon tests specifically, but rather on the avoidance of debris-creating Space activities in general as legally appropriate behaviour at the global level. In 2019, the ISO released a third edition of its Space Debris Mitigation Requirements,[72] with a fourth edition currently in development.[73]

Making a set of international guidelines binding in domestic law, or within the 22 member-state ESA, is subsequent practice. It is also state practice and, most importantly, evidence of *opinio juris*, since it suggests that national governments feel an obligation to ensure that the guidelines are followed.

Other debates and decisions within international organisations provide less direct but still significant evidence of a shift in international opinion (although probably not evidence of *opinio juris*) concerning Space debris and kinetic ASAT weapon testing. For example, in 2012 the UN secretary general established a Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities. The group's consensus report, released the following year, observed that 'in the context of international peace and security, there is growing concern that threats to vital space capabilities may increase during the next decade as a result of both natural and man-made hazards and the possible development of disruptive and destructive counter-space capabilities'.[74] It then stated, 'Intentional destruction of any on-orbit spacecraft and launch vehicle orbital stages or other harmful activities that generate long-lived debris should be avoided.'[75]

[70] European Space Agency (ESA), 'European Cooperation for Space Standardization (ECSS)' (2022), *ECSS*, online: ecss.nl.

[71] ESA, 'Mitigating space debris generation' (2022), *ESA*, online: www.esa.int/Safety_Security/Space_Debris/Mitigating_space_debris_generation.

[72] ISO, 'ISO 24113:2019, Space systems – Space debris mitigation requirements' (July 2019), *ISO*, online: www.iso.org/standard/72383.html.

[73] ISO, 'ISO/DIS 24113 Space systems – Space debris mitigation requirements' (2022), *ISO*, online: www.iso.org/standard/83494.html.

[74] *Report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities*, UNGAOR, 68th Sess, UN Doc A/68/189 (2013) at para. 6.

[75] Ibid. at para. 45.

In 2014, the European Union released a draft International Code of Conduct for Outer Space Activities.[76] At its core, the draft code included a set of principles, including 'the responsibility of states to refrain from the threat or use of force against the territorial integrity or political independence of any state' and the 'inherent right of states to individual or collective self-defence'.[77] In this context, the draft code identified that states are required 'to take all appropriate measures and cooperate in good faith to avoid harmful interference with outer space activities' and 'to take all appropriate measures to prevent outer space from becoming an arena of conflict'.[78]

In 2019, COPUOS adopted 21 guidelines for the long-term sustainability (LTS) of Space activities.[79] Although the guidelines do not refer specifically to kinetic ASAT weapon testing, they express considerable concern about Space debris, the operational stability of the environment, and the need to ensure that defence and security measures are 'compatible with preserving outer space for peaceful exploration and use'. They also refer to the 2013 report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities, discussed above. For the purposes of our analysis, the LTS guidelines provide yet further evidence that states are changing their practice and views on this issue, thus contributing to the development of a ban on ASAT weapon testing that creates long-lasting debris. We will return to COPUOS shortly when we review the responses of state delegations to another significant 2019 development: the Indian ASAT weapon test.

[76] European External Action Service, 'EU proposal for an international space code of conduct, draft' (31 March 2014), *European Union*, online: www.eeas.europa.eu/node/14715_en.

[77] Ibid. at para. 26.

[78] Ibid. at paras. 27–28. The EU's draft code, it must be said, has not received widespread support, in part because states outside the EU, especially developing states, were not involved in the negotiations. See Rajeswari Pillai Rajagopalan, 'International Code of Conduct for Outer Space Activities: Major Asian perspectives', *Asia Dialogue* (27 October 2014), online: theasiadialogue.com/2014/10/27/international-code-of-conduct-for-outer-space-activities-major-asian-perspectives.

[79] Committee on the Peaceful Uses of Outer Space, 'Guidelines for the Long-term Sustainability of Outer Space Activities', Annex II in *Report of the Committee on the Peaceful Uses of Outer Space, Sixty-Second Session (12–21 June 2019)*, UNGAOR, 74th Sess, Supp No 20, UN Doc A/74/20, online: www.unoosa.org/res/oosadoc/data/documents/2019/a/a7420_0_html/V1906077.pdf.

8.1.5 *The Indian ASAT Weapon Test: Conduct and Responses*

As mentioned, in 2007 the chair of the Indian Space Research Organisation said that China should not have tested a kinetic ASAT weapon in a manner that created long-lasting debris 'as it goes against international convention'.[80] Then, in 2012, Vijay Kumar Saraswat, the scientific adviser to the Indian defence minister, told *India Today* that the country possessed ASAT technology but '[w]e will not do a physical test (actual destruction of a satellite) because of the risk of space debris affecting other satellites.'[81] Yet seven years later, on 27 March 2019, India conducted exactly such a kinetic ASAT weapon test against one of its own satellites.[82] The test is relevant to our legal analysis in several respects, beginning with the way it was conducted.

The satellite was struck at an altitude of about 283 kilometres, which according to Indian officials was low enough that the resulting debris would quickly decay and fall back to Earth. In an interview with Reuters, the chair of India's Defence Research and Development Organisation, G. Satheesh Reddy, asserted that the debris will 'vanish in no time' and 'should be dying down within 45 days'.[83] He repeated that assurance at a press conference on 6 April 2019, stating that the debris 'will decay in [a] few weeks' and 'won't cause problem to any existing space assets'.[84] At that same press conference, Reddy explained that the interception was 'specially designed' to strike the satellite at an angle so as to ensure 'minimal debris'.[85] It is possible that these assertions were based, in part, on the perceived results of the 2008 US satellite strike – as discussed above.

[80] Lin, op. cit.

[81] Sandeep Unnithan, 'India has all the building blocks for an anti-satellite capability', *India Today* (27 April 2012), online: www.indiatoday.in/india/story/agni-v-drdo-chief-dr-vijay-kumar-saraswat-interview-100405-2012-04-27 (quoting Vijay Kumar Saraswat).

[82] Jeffery Gettleman and Hari Kumar, 'India shot down a satellite, Modi says, shifting balance of power in Asia', *New York Times* (27 March 2019), online: www.nytimes.com/2019/03/27/world/asia/india-weather-satellite-missle.html.

[83] Sanjeev Miglani, 'India says space debris from anti-satellite test to "vanish" in 45 days', *Reuters* (28 March 2019), online: https://www.reuters.com/article/us-india-satellite-idUSKCN1R91DM.

[84] India Today Web Desk, 'Mission Shakti: ASAT test debris will decay within 45 days, says DRDO chief Satheesh Reddy', *India Today* (6 April 2019), online: www.indiatoday.in/science/story/mission-shakti-asat-satellite-debris-decay-45-days-drdo-gs-reddy-1495670-2019-04-06.

[85] Rahul Bedi, 'India's DRDO reveals additional details of recent ASAT missile test', *Jane's 360* (8 April 2019), online: https://www.janes.com/defence-news/news-detail/indias-drdo-reveals-additional-details-of-recent-asat-missile-test.

As we explained in the previous chapter, the Indian military's effort to minimise debris did not fully succeed. There are roughly 130 pieces of debris from the test in the USSPACECOM catalogue, meaning that they were in orbit long enough to be tracked and assigned an identifier. It is reasonable to assume that there was at least one order of magnitude more (i.e. 1,300) pieces between one and ten centimetres in size, a size range too small to track but still potentially lethal to satellites, Space stations and astronauts. Some of this long-lived debris, placed on highly eccentric orbits with apogees greater than 1,000 kilometres, remained in Space for over a year (see Figure 7.2 in Chapter 7) – crossing multiple orbital shells twice per orbit.

As with the 2007 Chinese ASAT weapon test, it could be argued that the 2019 Indian ASAT weapon test, as a prominent instance of subsequent practice, confirmed and thus bolstered an interpretation of the Article I, second paragraph, freedom of exploration and use that would allow such testing. But two factors lead to a different conclusion. First, India sought to *avoid* creating long-lasting debris. As a result, its conduct supports an interpretation of the second paragraph of Article I that prohibits tests that do this. The same conduct concurrently contributes to the development of a parallel rule of customary international law. Second, an examination of the responses to the Indian test confirms that the positions of states on this matter are changing.

8.1.6 *Responses to the 2019 Indian ASAT Weapon Test*

The Indian ASAT weapon test initially escaped criticism, presumably because of the assurances that no long-lasting debris would result. The United States' response began with a State Department spokesperson affirming that 'the issue of space debris is an important concern for the U.S. government. We took note of Indian government statements that the test was designed to address the debris issues'.[86] Then, NASA Administrator James Bridenstine weighed in. He explained that there were 400 identified pieces of trackable debris and 24 of them were in elliptical orbits that extended above the International Space Station,[87] increasing

[86] Frank A Rose, 'India's anti-satellite test presents a window of opportunity for the Trump administration: Will it take advantage?' (10 May 2019), *The Brookings Institution*, online (blog): www.brookings.edu/blog/order-from-chaos/2019/05/10/indias-anti-satellite-test-presents-a-window-of-opportunity-for-the-trump-administration.

[87] Of the 400 noted debris pieces, only 130 were eventually included in the public catalogue.

the risk of collisions with the ISS by an estimated 44 per cent.[88] Bridenstine called this 'a terrible, terrible thing',[89] and stated that this 'kind of activity is not compatible with the future of human spaceflight that we need to see happen . . . It is not acceptable for us to allow people to create debris fields that put at risk our people'.[90] US Defense Secretary Patrick Shanahan was also critical of India's test: 'we all live in space, let's not make it a mess. Space should be a place where we can conduct business. Space is a place where people should have the freedom to operate'.[91]

The Russian Foreign Ministry issued a press release the day after the test in which it acknowledged India's peaceful intent but noted that the test was nonetheless the result of a larger deterioration in arms control.[92] It urged India to support the Chinese–Russian draft treaty on Space weapons.[93] Pakistan, India's regional rival, expressed 'grave concern' about the test and the threat posed by the resulting Space debris to orbital installations such as the ISS.[94]

As the Indian ASAT weapon test took place just before the annual session of the Legal Subcommittee of COPUOS in early April 2019, several states expressed concerns during the session about debris-generating ASAT weapon testing. Germany stated,

> it is appropriate to recall that any intentional destruction of an on-orbit space craft generating additional space debris poses a major safety threat to space activities conducted for the benefit and in the interest of all humankind. It must therefore be avoided. Due to the energy converted during the impact of anti-satellite weapons, even in low earth orbit, any

[88] Kai Schultz, 'NASA says debris from India's antisatellite test puts space station at risk', *New York Times* (2 April 2019), online: www.nytimes.com/2019/04/02/world/asia/nasa-india-space-debris.html.

[89] Ibid.

[90] Rose, op. cit.

[91] 'Mission Shakti: Space debris warning after India destroys satellite', *BBC News* (28 March 2019), online: www.bbc.com/news/world-asia-india-47729568.

[92] Andrew Korybko, 'Russia's response to India's ASAT missile test wasn't what New Delhi expected', *Global Research* (1 April 2019), online: www.globalresearch.ca/russias-response-to-indias-asat-missile-test-wasnt-what-new-delhi-expected/5673254.

[93] Ibid.

[94] Government of Pakistan, media briefing, 'Record of press briefing by spokesperson on Friday, 05 April 2019' (2019), *Ministry of Foreign Affairs*, online: mofa.gov.pk/record-of-press-briefing-by-spokesperson-on-friday-05-april-2019. See also Asad Hashim, 'Pakistan expresses "grave concern" over Indian space weapons test', *Al Jazeera* (3 April 2019), online: www.aljazeera.com/news/2019/4/3/pakistan-expresses-grave-concern-over-indian-space-weapons-test.

> resulting space debris is uncontrollable and increases collision risk, including in higher orbits. Therefore, generally accepted international standards such as the Space Debris Mitigation Guidelines of COPUOS and the ESA as well as the recommendations of the group of governmental experts on transparency and confidence building measures in outer space activities urge responsible space actors to refrain from intentional destruction of space objects. Like already done in other forums, Germany calls for a legally binding prohibition of the intentional destruction of space objects resulting in the generation of long-lasting debris, including in situation[s] of armed conflict.[95]

France said that it is 'the obligation of states to abstain ... [from] the intentional destruction of space objects'.[96] Finland observed, 'Any unnecessary or voluntary creation or increase of in-orbit space debris population can be viewed ... to run counter to the norms and principles of responsible behaviour in outer space.'[97] A delegate from the Netherlands stated,

> My government is concerned with the deliberate and unnecessary creation of space debris through the destruction of space objects. In our view, this would constitute a threat to the safety and sustainable use of outer space, and would not be in line with guideline 4 of the Space Debris Mitigation Guidelines.[98]

Canada said, 'Impacts and collisions involving space debris present a serious challenge to our continued exploration and use of outer space.'[99] Austria commented, 'The intentional destruction of spacecraft, in contradiction to the abovementioned Space Debris Mitigation Guidelines, may therefore be an indicator of fault when it comes to determining the liability of the launching state for damage caused by space debris created

[95] Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (COPUOS), *Digital Recording of 9 April 2019 from 10:00 to 13:00*, 58th Sess (statement of German delegate at 0:49:21 to 0:51:01), *United Nations*, online: https://www.unoosa.org/oosa/en/ourwork/copuos/lsc/2019/index.html. The German position is also expressed, without attribution, by the Legal Subcommittee of COPUOS in its 2019 report of its annual session. Committee on the Peaceful Uses of Outer Space, *Report of the Legal Subcommittee on Its Fifty-Eighth Session, Held in Vienna from 1 to 12 April 2019*, UNGAOR, 62nd Sess, UN Doc A/AC.105/1203 (2019) at 26, para. 184.

[96] Legal Subcommittee of the COPUOS, *Digital Recording of 9 April 2019 from 10:00 to 13:00*, 58th Sess (statement of French delegate at 0:56:45 to 0:56:55), *United Nations*, online: https://www.unoosa.org/oosa/en/ourwork/copuos/lsc/2019/index.html (translation by the authors).

[97] Ibid. (statement of Finish delegate at 0:58:00 to 0:58:16).

[98] Ibid. (statement of the Netherlands delegate at 0:63:17 to 0:63:38).

[99] Ibid. (statement of the Canadian delegate at 0:73:13 to 0:73:21).

by the intentional destruction.'[100] Last but not least, the European Space Agency, which holds observer status within COPUOS, stated, 'Intentional destructions, which will generate long-lived debris, should not be planned or conducted.'[101]

Collectively, these responses to India's test constitute subsequent practice for the purposes of a reinterpretation of the second paragraph of Article I of the Outer Space Treaty against ASAT weapon testing that creates long-lasting debris. They also constitute state practice and evidence of *opinio juris* in support of a developing rule of customary international law, as will be discussed below.

8.1.7 The 2021 Russian ASAT Weapon Test

As we explained in the previous chapter, the Russian military used a ground-based missile to strike Kosmos 1408 on 15 November 2021. It had previously tested the PL-19 Nudol missile's capabilities as an ASAT weapon through 'flybys', i.e. without attempting to strike an actual satellite, thereby demonstrating at least some concern about the creation of long-lasting Space debris.[102] No such concern was manifest this time.

The defunct Soviet-era satellite had a mass of about 1,750 kilograms and was orbiting at an altitude of about 480 kilometres. Due to the high impact energies involved in such a strike, debris ended up on highly eccentric orbits that cross the orbital altitudes of thousands of other satellites twice per revolution. Moreover, as the debris de-orbits with time, it will all pass through the altitudes of the International Space Station and China's new Tiangong Space station. Indeed, shortly after test, the crew members of the ISS – four Americans, one German and two Russians – were woken up by their respective mission controls, told that there had been a 'satellite break-up', and asked to close the hatches to the

[100] Legal Subcommittee of the COPUOS, *Digital Recording of 9 April 2019 from 15:00 to 17:36*, 58th Sess (statement of the Austrian delegate at 0:77:37 to 0:77:58), *United Nations*, online: https://www.unoosa.org/oosa/en/ourwork/copuos/lsc/2019/index.html.

[101] Legal Subcommittee of the COPUOS, *Digital Recording of 9 April 2019 from 10:00 to 13:00*, 58th Sess (statement of the European Space Agency delegate at 0:71:37 to 0:71:45), *United Nations*, online: https://www.unoosa.org/oosa/en/ourwork/copuos/lsc/2019/index.html.

[102] See Secure World Foundation, op. cit.

radial modules on the station.[103] The crew members were then directed into their hardened Crew Dragon and Soyuz capsules for two hours as the ISS passed through the debris cloud.

Remarkably, the Russian Defence Ministry denied that debris from the test threatened other satellites. '[E]merging fragments at the time of the test and in terms of the orbit's parameters did not and will not pose any threat to orbital stations, satellites and space activity', it said.[104] It also noted, 'Earlier, such tests in outer space were already conducted by the United States, China, and India.'

In response, US Secretary of State Anthony Blinken issued a statement that read, in part,[105]

> The long-lived debris created by this dangerous and irresponsible test will now threaten satellites and other space objects that are vital to all nations' security, economic, and scientific interests for decades to come. In addition, it will significantly increase the risk to astronauts and cosmonauts on the International Space Station and other human spaceflight activities . . .
>
> We call upon all responsible spacefaring nations to join us in efforts to develop norms of responsible behavior and to refrain from conducting dangerous and irresponsible destructive tests like those carried out by Russia.

NASA Administrator Bill Nelson said,

> I'm outraged by this irresponsible and destabilizing action. With its long and storied history in human spaceflight, it is unthinkable that Russia would endanger not only the American and international partner astronauts on the ISS, but also their own cosmonauts. Their actions are reckless and dangerous, threatening as well the Chinese space station and the taikonauts on board. All nations have a responsibility to prevent the purposeful creation of space debris from ASATs and to foster a safe, sustainable space environment.[106]

[103] Elizabeth Howell, 'Hear how NASA alerted astronauts to incoming space debris after Russian anti-satellite test', *Space.com* (17 November 2021), online: www.space.com/space-station-crew-russian-space-debris-audio.

[104] 'Russia's top brass reports on successfully striking defunct satellite in tests', TASS Russian News Agency (16 November 2021), online: tass.com/science/1362125.

[105] Anthony J Blinken, press statement, 'Russia conducts destructive anti-satellite missile test' (15 November 2021), *US Department of State*, online: www.state.gov/russia-conducts-destructive-anti-satellite-missile-test.

[106] NASA, press release, 21-156, 'NASA administrator statement on Russian ASAT test' (15 November 2021), *NASA*, online: www.nasa.gov/press-release/nasa-administrator-statement-on-russian-asat-test.

NATO secretary general Jens Stoltenberg said the test was reckless, posed a threat to the ISS and the Chinese Space station, and showed that Russia was developing new weapons systems.[107] The North Atlantic Council, made up of representatives from all 30 NATO states, then released the following statement:[108]

> 1. The North Atlantic Council strongly condemns the Russian Federation's reckless and irresponsible anti-satellite missile test on 15 November 2021. This test caused an orbital debris field that significantly increases risk to human life and to the space-based assets of numerous nations and entities.
> 2. Russia's actions demonstrate a pattern of irresponsible behaviour and endanger the security, economic, scientific, and commercial interests of all nations and actors seeking to explore and use outer space for peaceful purposes.
> 3. This dangerous behaviour directly contradicts Russia's claims to oppose the "weaponisation" of space, and undermines the rules-based international order.
> 4. NATO Allies remain committed to protecting and preserving the peaceful access to and exploration of space for all humanity. We call upon all nations, including Russia, to join the international efforts to develop norms, rules and principles of responsible behaviour in order to reduce space threats, and to refrain from conducting dangerous and irresponsible destructive tests like those carried out by the Russian Federation.

Separate from this, France's Defence and Foreign Ministries issued a joint statement in which they said the test was 'destabilising, irresponsible and likely to have consequences for a very long time in the space environment and for all actors in space'.[109] In an earlier tweet, French defence minister Florence Parly went so far as to call the Russian military 'space vandals' who 'generate debris that pollutes and puts our astronauts and satellites in danger'.[110]

[107] North Atlantic Treaty Organization (NATO), press statement, 'Doorstep statement by NATO secretary general Jens Stoltenberg at the Council of the EU' (16 November 2021), *NATO*, online: www.nato.int/cps/fr/natohq/opinions_188605.htm.

[108] NATO, press release, (2021) 170, 'Statement by the North Atlantic Council on the recent anti-satellite missile test conducted by the Russian Federation' (19 November 2021), *NATO*, online: www.nato.int/cps/en/natohq/news_188780.htm.

[109] 'Germany and France slam Russia for satellite strike', *Straits Times* (17 November 2021), online: www.straitstimes.com/world/europe/germany-and-france-slam-russia-for-satellite-strike.

[110] Florence Parly, 'L'Espace est un bien commun, celui des 7,7 milliards d'habitants de notre planète: Les saccageurs de l'Espace ont une responsabilité accablante en générant

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Josep Borrell, the high representative of the European Union for Foreign Affairs and Security Policy, issued a statement on behalf of all 27 EU Member States that read, in part,[111]

> The European Union strongly condemns the Russian Federation's conduct of a kinetic direct-ascent anti-satellite (ASAT) weapon test against its own satellite, COSMOS 1408, resulting in its destruction by a missile, as a clear act of irresponsible behaviour in outer space. It generated a large amount of space debris that constitute a long-lasting risk for crewed and un-crewed space activities, including for the safety of astronauts and cosmonauts at the International Space Station. This action goes also against the principles reflected in the UN Space Debris Mitigation Guidelines and will jeopardize the free access to and use of space for all States for many years. It also contradicts the position expressed by the Russian Federation in multilateral fora, including in its contribution to the report of the UN Secretary General on responsible behaviour in outer space. This puts the credibility of its stance into question.
>
> The conduct of such tests are dangerous and highly destabilising, as potentially leading to deteriorating the confidence between space actors, increasing the perception of threats. This could lead to potential catastrophic consequences. The European Union continues to urge all States to refrain from the irresponsible behaviour of destructing space objects that generate space debris in order to preserve the safe, secure and sustainable use of outer space for present and future generations.

Nine non-EU states – North Macedonia, Montenegro, Albania, Iceland, Liechtenstein, Norway, Ukraine, Moldova and Georgia – aligned themselves with this declaration.[112]

The British defence minister also weighed in, saying that the test 'shows a complete disregard for the security, safety and sustainability of space. The debris resulting from this test will remain in orbit putting satellites and human spaceflight at risk for years to come'.[113] A joint

des débris qui polluent et mettent nos astronautes et satellites en danger' (16 November 2021 at 07:30), *Twitter*, online: twitter.com/florence_parly/status/1460586002230263822 (authors' translation).

[111] Council of the European Union, press release, 'Statement by the high representative of the Union for foreign affairs and security policy on behalf of the EU on the Russian anti-satellite test on 15 November 2021' (19 November 2021), *European Union*, online: www.consilium.europa.eu/en/press/press-releases/2021/11/19/statement-by-the-high-representative-of-the-union-for-foreign-affairs-and-security-policy-on-behalf-of-the-eu-on-the-russian-anti-satellite-test-on-15-november-2021.

[112] Ibid.

[113] 'Russian anti-satellite missile test draws condemnation', *BBC News* (16 November 2021), online: www.bbc.com/news/science-environment-59299101.

media release from the Australian defence and foreign ministers described the Russian test as 'a provocative and dangerous act that demonstrated the threats to space systems are real, serious and growing'.[114] The German foreign minister was equally critical:

> This irresponsible behaviour carries a risk of error of judgement and escalation. The test underlines the risks and growing threats for security and stability in space and the urgent need for the international community to agree on rules for the peaceful and lasting use of space and on measures aimed at reinforcing safety and confidence.[115]

In Japan, the Ministry of Foreign Affairs issued a statement that read, in part,[116]

> The destruction of a satellite that generates a large amount of space debris indiscriminately increases the risk of collisions of on-orbit space objects and is an irresponsible behavior that undermines sustainable and stable use of outer space. As the importance of outer space is increasing, the Government of Japan is concerned about the destruction also from the perspective of peaceful use of outer space and security. In addition, Space Debris Mitigation Guidelines adopted unanimously by the member states of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), including Russia, in 2007 require that the intentional destruction of any on-orbit space objects that generates long-lived space debris should be avoided. In this respect, the test runs counter to the guidelines.
>
> The Government of Japan expresses concerns towards the test and calls upon the Government of Russia not to conduct this kind of test in the future.
>
> As it is important to ensure the peaceful use of outer space, the international rule-making is necessary for sustainable and stable use of outer space. The Government of Japan will continue to call upon relevant countries for their responsible behavior in preventing the generation and diffusion of long-lived space debris and to engage actively in the discussions in the international arena on responsible behavior in outer space.

[114] Australian minister for defence and minister for foreign affairs, joint media release, 'Russian anti-satellite weapons testing' (17 November 2021), *Australian Department of Defence*, online: www.minister.defence.gov.au/minister/peter-dutton/media-releases/russian-anti-satellite-weapons-testing.

[115] 'Germany and France slam Russia for satellite strike', op. cit.

[116] Yoshida Tomoyuki, press release, 'An anti-satellite test conducted by the government of Russia' (18 November 2021), *Ministry of Foreign Affairs of Japan*, online: www.mofa.go.jp/press/release/press3e_000270.html.

In South Korea, the Foreign Ministry sent a text message to reporters that read, 'We are concerned about the anti-satellite weapon test that took place Nov. 15 and in particular numerous pieces of debris created in space as a result of the test.'[117] In the same message, it urged 'all nations to act responsibly in space to ensure peaceful and sustainable use of space, and work together to advance related international rules'.

Then, there was China. When asked about the Russian test during a press conference the following day, Foreign Ministry spokesperson Zhao Lijian said, 'We noted relevant reports and that Russia has yet to respond. I think it is too early to make any comment.'[118] Two months later, a report from the Chinese state-controlled *Global Times* – widely regarded as a mouthpiece for the government – signalled that China was very concerned about Russia's action, not least after a close conjunction between one of its scientific satellites and a piece of debris from the test. A long excerpt from that report is reproduced here, because of its considerable importance:[119]

> The Space Debris Monitoring and Application Center of the China National Space Administration sent out a warning on an extremely dangerous rendezvous on Tuesday between the Tsinghua Science satellite and Russia's Kosmos 1408 debris. An expert on space debris told the Global Times on Wednesday that the data released showed that there was a high chance of collision between the debris and the satellite on Tuesday.
>
> 'Currently, they keep a safe distance but the chance for these two getting close in the future cannot be excluded,' Liu Jing, a space debris expert said.
>
> The closest distance between Tsinghua's satellite and the Russian debris was 14.5 meters, with a relative speed of 5.27 kilometers per second. Liu told the Global Times that it is very rare to see the distance between space debris and spacecrafts within just a dozen of meters, as normally during the debris–spacecraft rendezvous, the two keep a distance of several tens of kilometers . . .

[117] Park Si-soo, 'China silent, South Korea "concerned" over debris created by Russia's anti-satellite missile test', *SpaceNews* (17 November 2021), online: spacenews.com/china-silent-south-korea-concerned-over-debris-created-by-russias-anti-satellite-missile-test/.

[118] Ibid.

[119] Fan Wei, 'Following "extremely dangerous rendezvous" between Russian space debris and Chinese satellite, Chinese expert says it's possible the two get closer again', *Global Times* (20 January 2022), online: www.globaltimes.cn/page/202201/1246440.shtml.

> The debris came from a Russian anti-satellite test on November 15, 2021. Russia's anti-satellite test produced an estimated 1,600 pieces of debris larger than 10 centimeters, most of which were distributed in an orbital altitude range of 400 to 1,100 kilometers, according to media reports.
>
> Experts said that China has launched hundreds of satellites within this orbital altitude. In theory, these space debris may pose a threat to China's spacecraft. Since Russia's anti-satellite tests last November, China has been closely monitoring the space debris created and calculated their locations daily based on the latest data to predict if there is a risk of collision between these debris and Chinese satellites, Liu said. He also highlighted that 'if there is [a possibility of collision] we need to quickly notify our satellites and make some evasive maneuvers in advance to avoid these debris. This is the most feasible method at present.'
>
> Huang Zhicheng, an aerospace expert, said that as space debris has an increasingly frequent impact on human spaceflights, the tasks of reducing and removing space debris should be put on the corresponding agenda.
>
> 'It is not only necessary to conduct research on experimental devices or spacecraft to remove space debris, but also to formulate corresponding international laws and regulations on the generation of space debris under the framework of the UN,' Huang said.

This report from *Global Times* and the responses summarised above demonstrate that Russia's 2021 ASAT weapon test generated considerable concern among other states, including all the other major space-faring states. Indeed, as Nivedita Raju observed, 'India's destructive ASAT test in March 2019 generated fewer and much softer responses than Russia's.'[120] Many of the responses to the Russian test will constitute subsequent practice for the purposes of interpreting the second paragraph of Article I of the Outer Space Treaty, as well as state practice and evidence of *opinio juris* for the purposes of customary international law. Just as importantly, not a single state responded to the Russian ASAT weapon test by saying that it was an appropriate or internationally legal action.

In terms of international law-making, it is especially significant that Russia denied that the ASAT weapon test created risks for operational satellites or Space stations. As we demonstrated in the previous chapter, the denial was scientifically implausible. Yet it also constitutes a clear, if implicit, acknowledgement, by the Russia government, that the deliberate

[120] Nivedita Raju, 'Russia's anti-satellite test should lead to a multilateral ban' (7 December 2021), *Stockholm International Peace Research Institute*, online: www.sipri.org/commentary/essay/2021/russias-anti-satellite-test-should-lead-multilateral-ban.

creation of dangerous debris is unacceptable today. The denial was, in short, more legally relevant than the test itself as subsequent practice for the purpose of interpreting the second paragraph of Article I, and as state practice and evidence of *opinio juris* for customary international law.

As we explained in the previous chapter, the prohibition on torture (a rule found in numerous treaties as well as customary international law) provides a powerful example of how denials of actions can contribute to those actions being, or becoming, illegal. To quote Anthony D'Amato again:

> It seems . . . important to ask whether the states that engage in torture are (a) disclosing that they are torturing people, (b) proclaiming that what they are doing is legally justified, and (c) implicitly inviting other states to do likewise on the ground that, if torture is legally permissible for them, it is legally permissible for all states.[121]

D'Amato went on to explain that 'hiding, cover-up, minimization, and non-justification . . . betoken a violation of law' and therefore constitute legally relevant state practice *in support of* a rule prohibiting the actions in question.[122] Russia, by denying that it created dangerous debris in November 2021, was strengthening, not weakening, a possible new rule against testing ASAT weapons in ways that create long-lasting debris.

8.1.8 *United Nations General Assembly Resolutions 75/36 and 76/231*

In December 2020, the United Nations General Assembly adopted Resolution 75/36 on Reducing Space Threats through Norms, Rules and Principles of Responsible Behaviours.[123] The resolution:

> Encourages Member States to study existing and potential threats and security risks to space systems, including those arising from actions, activities or systems in outer space or on Earth, characterize actions and activities that could be considered responsible, irresponsible or threatening and their potential impact on international security, and share their ideas on the further development and implementation of norms, rules and principles of responsible behaviours . . .

[121] Anthony D'Amato, 'Custom and treaty: A response to Professor Weisburd' (1988) 21:3 *Vanderbilt Journal of Transnational Law* 459 at 466.
[122] Ibid. at 469.
[123] *Reducing Space Threats through Norms, Rules and Principles of Responsible Behaviours*, GA Res 75/36, UNGAOR, 75th Sess, 37th Plen Mtg, UN Doc A/RES/75/36 (2020).

The resolution further requested that the UN secretary general 'seek the views of Member States'. Those views, compiled in a report to the General Assembly at its 76th session in September 2021, show strong support for restrictions on kinetic ASAT weapon testing.[124]

Russia called for 'a complete and comprehensive ban on space-based strike weapons as well as on any land-, air-, or sea-based systems designed to destroy objects in outer space'. China expressed a similar view. Australia, Canada, France, Germany, Italy, Japan, Luxembourg, the Netherlands, Norway, Slovenia, the United Kingdom and the European Union all expressed the view that kinetic ASAT weapon tests should be avoided. Ireland, New Zealand and the United States identified kinetic ASAT weapon tests as a category of behaviour 'that could be considered during further development and implementation of norms, rules, and principles of responsible behaviours'. Brazil, Mexico, Sweden and Switzerland expressed support for multilateral negotiations leading to legally binding constraints on kinetic ASAT weapon testing.[125] Most importantly, not a single state in its response submitted for this United Nations report considered the testing of kinetic ASAT weapons to be an appropriate or internationally legal action.

Then, in December 2021, the United Nations General Assembly adopted Resolution 76/231,[126] which created an open-ended working group:

> (a) To take stock of the existing international legal and other normative frameworks concerning threats arising from State behaviours with respect to outer space;

[124] *Report of the Secretary-General: Reducing Space Threats through Norms, Rules and Principles of Responsible Behaviours*, UNGAOR, 76th Sess, UN Doc A/76/77 (2021).

[125] It should be noted that expressing support for treaty negotiations does not indicate a lack of belief in the existence of customary international law on the same point. A treaty can provide clarity and therefore certainty that customary international law cannot provide. It can also serve to 'crystallise' customary international law, turning a newly emerged rule into a concrete standard, or contribute to the 'progressive development' of a new rule.

[126] *Reducing Space Threats through Norms, Rules and Principles of Responsible Behaviours*, GA Res 76/231, UNGAOR, 76th Sess, 54th Plen Mtg, UN Doc A/RES/76/231 (2021). There were 150 votes in favour, eight against (China, Cuba, the Democratic People's Republic of Korea, Iran, Nicaragua, the Russian Federation, Syria and Venezuela), and seven abstentions (Armenia, Belarus, Central African Republic, India, Israel, Pakistan and Tajikistan). See United Nations (UN), Meetings Coverage, GA/12398, 'Approving $3.12 billion programme budget, General Assembly adopts 26 resolutions, 2 decisions, as main part of seventy-sixth session concludes' (24 December 2021), *UN*, online: www.un.org/press/en/2021/ga12398.doc.htm.

(b) To consider current and future threats by States to space systems, and actions, activities and omissions that could be considered irresponsible;
(c) To make recommendations on possible norms, rules and principles of responsible behaviours relating to threats by States to space systems, including, as appropriate, how they would contribute to the negotiation of legally binding instruments, including on the prevention of an arms race in outer space;
(d) To submit a report to the General Assembly at its 78th session.

It is possible that the open-ended working group will negotiate a draft treaty banning kinetic ASAT weapon testing, as recommended in an international open letter co-ordinated by the Outer Space Institute in September of that year.[127] That letter, signed by former prime ministers, Nobel laureates, retired astronauts and hundreds of other experts, was addressed to the president of the General Assembly.

The open-ended working group did not, however, experience a smooth launch. At their first organisational meeting, in early February 2022, the members of the group decided to postpone the first substantive session from mid-February to May. According to a report from Breaking Defense, 'Russia raised a litany of procedural complaints', arguing that national delegations needed more time to prepare and seeking 'new limitations preventing representatives of non-governmental organizations (NGOs) from speaking or providing direct input'. The author of the report, the well-informed Theresa Hitchens, added some extra colour when she explained that the latter issue 'was left unresolved when the formal meeting adjourned to a private venue, after the clock ran out on interpretation services at the Palais de[s] Nations and building management threatened to kill the lights on the diplomatic squabbling'.[128]

It is important to note that early February 2022 was a time of newly heightened tension between Russia and Western states, with missiles, tanks and nearly 200,000 Russian troops massed on Ukraine's borders. Aidan Liddle, the British ambassador to the Conference on Disarmament in Geneva, took to Twitter to express a more optimistic view of the squabbling within the working group. '[T]hat's the nature of multilateral

[127] 'International open letter on kinetic anti-satellite (ASAT) testing' (2 September 2021), *Outer Space Institute*, online: outerspaceinstitute.ca/docs/OSI_International_Open_Letter_ASATs_PUBLIC.pdf.

[128] Theresa Hitchens, 'No love from Russia for UN military space norms meeting', *Breaking Defense* (9 February 2022), online: breakingdefense.com/2022/02/no-love-from-russia-for-un-military-space-norms-meeting.

diplomacy', he wrote. '[A]nd when it works, it's worth the wait'.[129] Russia's subsequent invasion of Ukraine on February 24 and the corresponding near breakdown in relations with Western states simultaneously make the new working group even more relevant, while creating major uncertainty for its future.[130]

8.1.9 *The 2022 United States 'Unilateral Declaration'*

Something quite unusual happened on 18 April 2022 when, during a speech at Vandenberg Space Force Base in California, US Vice President Kamala Harris solemnly declared that 'as of today, the United States commits not to conduct destructive direct ascent anti-satellite missile testing'.[131] In international law, statements such as these are called 'unilateral declarations' and are legally binding.

In the 1974 *Nuclear Tests Cases*, the International Court of Justice wrote,

> One of the basic principles governing the creation and performance of legal obligations, whatever their source, is the principle of good faith. Trust and confidence are inherent in international co-operation, in particular in an age when this co-operation in many fields is becoming increasingly essential. Just as the very rule of *pacta sunt servanda* in the law of treaties is based on good faith, so also is the binding character of an international obligation assumed by unilateral declaration. Thus interested States may take cognizance of unilateral declarations and place confidence in them, and are entitled to require that the obligation thus created be respected.[132]

[129] Aidan Liddle, 'No, but that's the nature of multilateral diplomacy – and when it works, it's worth the wait' (10 February 2022 at 17:12), *Twitter*, online: twitter.com/AidanLiddle/status/1491897924564967430.

[130] We address the implications of Russia's attack on Ukraine further in the Conclusion to this book.

[131] The White House, speeches and remarks, 'Remarks by Vice President Harris on the ongoing work to establish norms in space' (18 April 2022), *The White House*, online: www.whitehouse.gov/briefing-room/speeches-remarks/2022/04/18/remarks-by-vice-president-harris-on-the-ongoing-work-to-establish-norms-in-space. See also the White House, 'Vice President Harris delivers remarks about our ongoing work to establish norms for space' (18 April 2022), *YouTube*, online: https://www.youtube.com/watch?v=oATgItF2CFQ. For the associated 'fact sheet', see the White House, statements and releases, 'Fact sheet: Vice President Harris advances national security norms in space' (18 April 2022), *The White House*, online: www.whitehouse.gov/briefing-room/statements-releases/2022/04/18/fact-sheet-vice-president-harris-advances-national-security-norms-in-space.

[132] *Nuclear Tests Case* (*Australia* v. *France*), [1974] ICJ Rep 253 at 268, para. 46; *Nuclear Tests Case* (*New Zealand* v. *France*), [1974] ICJ Rep 457 at 473, para. 49.

The unilateral declaration at issue in the *Nuclear Tests Cases* was a commitment not to test nuclear weapons in the atmosphere, made publicly by both the French president and the French foreign minister. The parallel with Vice President Harris's declaration, which also involves weapons testing in an 'area beyond national jurisdiction', is striking.

In 2006, the United Nations International Law Commission (ILC) completed a decade-long study on unilateral declarations and issued a set of ten Guiding Principles. These principles confirmed that a unilateral declaration, if made publicly, in clear and specific terms, and by an authority vested with the power to do so, constitutes a binding commitment vis-à-vis all other states.[133] Those states 'may then take them into consideration and rely on them; such States are entitled to require that such obligations be respected'.[134] The ILC also confirmed that a unilateral declaration 'cannot be revoked arbitrarily', with arbitrariness being determined, in part, by 'the extent to which those to whom the obligations are owed have relied on such obligations'.[135]

It is therefore clear that the United States is now bound, under international law, not to engage in direct-ascent ASAT missile tests. Importantly, other states may now rely on the US commitment, for instance, while deciding not to develop or test ground-based kinetic ASAT weapons themselves.

At the same time, it is important to note that the US unilateral declaration does not extend to, and therefore does not commit the United States to avoid, the testing of Space-based kinetic ASAT weapons or the testing of non-kinetic technologies such as lasers, jammers or cyber attacks, whether destructive or not. We also note that the United States already possesses the capability that it has committed not to test, as demonstrated by the use of a ship-based missile in 2008 to destroy a malfunctioning satellite. Nor does the unilateral declaration extend to the testing of missile defence interceptors, which are effectively dual-use ASAT weapons and, as demonstrated in the previous chapter, capable of generating long-lasting Space debris. But while the US unilateral declaration is tightly focused, this is not necessarily a bad thing, since it should make it easier for other states to follow suit, either by making

[133] International Law Commission, *Report of the Working Group on Unilateral Acts of States: Guiding Principles Applicable to Unilateral Declarations of States Capable of Creating Legal Obligations*, UNGAOR, 58th Sess, UN Doc A/CN.4/L.703 (2006).
[134] Ibid., principle 1.
[135] Ibid., principle 2.

their own declarations, or by refraining from testing such weapons themselves, or both.

The intent of the US government to create momentum and persuade others to make similar unilateral declarations is clear. As Vice President Harris said in the same speech,

> We are the first nation to make such a commitment. And today, on behalf of the United States of America, I call on all nations to join us.
>
> Whether a nation is spacefaring or not, we believe this will benefit everyone, just as space benefits everyone.
>
> In the days and months ahead, we will work with other nations to establish this as a new international norm for responsible behaviour in space . . .[136]

Canada, New Zealand, Japan, Germany, South Korea, the UK, and Australia soon made similar declarations. Now, a series of unilateral declarations cannot in themselves make a 'new international norm' that binds all states, but they can contribute to generally applicable rules in two ways. First, they count as 'subsequent practice' for the purposes of interpretating the second paragraph of Article I of the Outer Space Treaty, and specifically the 'freedom of exploration and use of space', in a manner that precludes kinetic ASAT weapon tests that create long-lasting debris. Second, they can contribute to the development of customary international law as both state practice and expressions of *opinio juris*.

8.2 Kinetic ASAT Weapon Tests and Customary International Law

In the first part of this chapter, we considered whether a ban on kinetic ASAT weapon tests that create long-lasting debris already exists, or might soon develop, as the result of a reinterpretation of the second paragraph of Article I of the Outer Space Treaty. We examined a range of 'subsequent practice' of the parties to that treaty and found that many of them are behaving as if ASAT weapon tests that create long-lasting debris are contrary to the 'freedom of exploration and use of space'. In this second part of the chapter, we consider whether 'state practice' and an accompanying *opinio juris* are contributing to the development of a parallel rule of customary international law.

[136] The White House, 'Remarks by Vice President Harris on the ongoing work to establish norms in space', op. cit. As this book was in press the UN General Assembly, on 7 Dec 2022, adopted Res 77/41 by a vote of 155 to 9. It: 'Calls upon all States to commit not to conduct destructive direct-ascent anti-satellite missile tests'.

The main difference between subsequent practice and state practice concerns the range of practice that must be examined. With treaty interpretation, it is the practice of the parties to the treaty that matters, whereas, in the case of customary international law, it is the practice of all states. Again, since nearly all spacefaring states are parties to the Outer Space Treaty,[137] we are saving readers a great deal of repetition by combining the analysis of subsequent practice for the purposes of treaty interpretation with the analysis of state practice for the purposes of customary international law.

Moreover, a treaty reinterpretation and the development of a rule of customary international law can occur in parallel to, and reinforce, each other. It is well established that a rule of customary international law can exist alongside a treaty provision to the same effect. As the International Court of Justice recognised in the *Nicaragua Case*: 'customary international law continues to exist and to apply, separately from international treaty law, even where the two categories of law have an identical content'.[138] Customary international law can even be generated by treaty provisions acting as state practice, as recognised by the same court in the *North Sea Continental Shelf Cases*.[139]

State practice can include both actions and inactions – for example, states saying or doing nothing in response to an action by another state.[140] But state practice cannot create a rule of customary international law on its own. One must also find evidence of *opinio juris*, a belief that the practice in question is legally required, or at least legally relevant.[141]

[137] A notable exception is Iran, which has signed but not ratified the treaty.

[138] *Military and Paramilitary Activities in and against Nicaragua* (*Nicaragua* v. *United States*), [1986] ICJ Rep 14 at 96, para. 179.

[139] *North Sea Continental Shelf Cases* (*Germany* v. *Denmark*; *Germany* v. *Netherlands*), [1969] ICJ Rep 3 at 41, para. 71.

[140] Iain MacGibbon, 'The scope of acquiescence in international law' (1954) 31 *British Yearbook of International Law* 143; Ian MacGibbon, 'Customary international law and acquiescence' (1957) 33 *British Yearbook of International Law* 115. The consent provided by acquiescence is inferred rather than implied, with many writers arguing that states – as full participants in the international legal system – have consented to 'secondary' procedural rules including the process by which customary international law is made and changed. See, e.g., D'Amato, *The Concept of Custom in International Law*, op. cit. at 41–44; Vaughan Lowe, 'Do general rules of international law exist?' (1983) 9:3 *Review of International Studies* 207; Serge Sur, *La coutume internationale, 2e cahier* (Paris: Librairies techniques, 1990) at 5, 10.

[141] Art. 38(1)(b) of the Statute of the International Court of Justice says the Court shall apply 'international custom, as evidence of a general practice accepted as law'. Statute of the International Court of Justice, 26 June 1945, Can TS 1945 No 7 Art. 38(1)(b)

Often, the same behaviour will constitute both state practice and evidence of *opinio juris*. This will often be the case with statements of national governments. It will also often be the case with positions articulated in the debates, decisions, declarations and statements of the member states of international organisations, whether made individually or collectively.[142] Even domestic laws, and the decisions of national courts, can sometimes constitute state practice and provide evidence of *opinio juris*.[143]

However, not all states are able to contribute equally to the making or changing of a rule of customary international law.[144] Any analysis must consider the vast differences between the technologies and activities of the major spacefaring states, as compared to those of a much larger number of other states. The United States, Russia, China, India, Japan and the 22 member states of the European Space Agency (collectively) have large Space programmes, conduct multiple launches each year, operate large numbers of satellites and conduct deep Space missions. Quite a few other states operate satellites that have been launched on their behalf, while nearly all states benefit from Space-based services

(entered into force 24 October 1945); *North Sea Continental Shelf Cases* (*Germany* v. *Denmark*; *Germany* v. *Netherlands*), [1969] ICJ Rep 3 at 44, para. 77. The challenge of identifying *opinio juris* when states acquiesce is addressed again (see previous footnote) by the argument that states consent to the process of customary international law, which includes shared understandings – often based on context – as to which behaviour is legally relevant, and which is not. See discussion and sources in Michael Byers, *Custom, Power and the Power of Rules* (Cambridge: Cambridge University Press, 1999) at 147–51.

[142] As Michael Akehurst explained, state practice 'covers any act or statement by a State from which views can be inferred about international law'. Michael Akehurst, 'Custom as a source of international law' (1975) 47:1 *British Yearbook of International Law* 1 at 10.

[143] In 1950, the United Nations International Law Commission included treaties, the decisions of international and domestic courts, national legislation, diplomatic correspondence and the opinions of foreign ministry legal advisers as examples of the various possible forms of state practice. 'Ways and means for making the evidence of customary international law more readily available', in *Yearbook of the International Law Commission 1950*, vol. 2 (New York: UN, 1957) at 368–72.

[144] See generally Byers, op. cit. See also the recent work of the International Law Commission on this topic, which led to General Assembly Resolution 73/203 and the statement, 'The requirement of a general practice, as a constituent element of customary international law, refers primarily to the practice of States that contributes to the formation, or expression, of rules of customary international law'. *Identification of Customary International Law*, GA Res 73/203, UNGAOR, 73rd Sess, UN Doc A/RES/73/203 (2018) at conclusion 4(1).

provided by other states or private companies. Roughly half of all states, most of them in the Global South, have no national Space programmes as such.

Clearly, the actions of the major spacefaring states will feature heavily in any analysis of customary international law within the Space context. So, too, will their considerable engagement in other forms of state practice, including their involvement in treaty making, 'soft law' instruments such as IADC and COPUOS guidelines, diplomatic protests and other public statements. But other, less powerful, spacefaring states also matter, as indeed do non-spacefaring states – especially when they speak in unison. Like other forms of international law, customary international law is grounded in the consent of states. If non-spacefaring states are opposed to a potential new or changed rule of customary international law, their views – expressed through public statements of various kinds – count as both state practice and evidence of *opinio juris*.

Two qualifying observations must be made here. First, no single state can prevent the development of a new or changed rule of customary international law. Instead, single or very small numbers of opposing states can become 'persistent objectors' to a new or changed rule, in which case they remain bound by the pre-existing rule of customary international law in their relations with other states.[145] Second, non-spacefaring states should pay close attention to developments in international law concerning Space – because silence is often treated as acquiescence during the making and changing of customary international law.[146] For this reason, it is concerning that to date only 102 states have chosen to become members of COPUOS. Although that number has steadily grown, just slightly more than half of the member states of the United Nations are as yet fully engaged in diplomacy and international law-making concerning Space. In some cases, this lack of full engagement reflects the fact that less wealthy states tend to have smaller and less resourced foreign ministries. Civil society can help in this regard: numerous non-governmental organisations have observer status at COPUOS and can monitor developments and alert the broader international community when attempts at legal change are under way.

[145] James A Green, *The Persistent Objector Rule in International Law* (Oxford: Oxford University Press, 2016).

[146] DW Greig, 'Reflections on the role of consent' (1989) 12 *Australian Yearbook of International Law* 125 at 137; Robert Kolb, 'Selected problems in the theory of customary international law' (2003) 50:2 *Netherlands International Law Review* 119 at 141.

Another aspect of customary international law is also relevant here: state practice cannot, in the absence of *opinio juris*, either contribute to or impede the development or change of a customary rule. For example, the 2007 Chinese ASAT weapon test might, as state practice, have little impact on customary international law if, as mentioned, the People's Liberation Army did indeed fail to secure the agreement of the Chinese Foreign Ministry in advance of the test or fully inform the Chinese leadership about the likely creation of large amounts of Space debris.[147] Just as significantly, China's response to the concerns expressed by other states did not include an assertion that the test was carried out in a legal way. The fact that subsequent Chinese ASAT weapon tests have avoided striking satellites confirms that the 2007 test lacked the requisite *opinio juris* to impede the development of a new rule of customary international law prohibiting such behaviour.

A similar point can be made about the United States' use of a ship-based missile against a satellite in 2008. Although the United States might or might not have been responding to the Chinese test the previous year, the strike was designed to occur at a very low altitude to prevent or at least reduce the creation of long-lasting Space debris.[148] Moreover, the United States justified its actions on the basis that the satellite was fully loaded with highly toxic thruster fuel and needed to be destroyed for health and environmental protection reasons. These aspects of the US strike thus provide evidence of *opinio juris* in favour of a developing rule not for, but against, ASAT weapon tests that create long-lasting debris.

Then there is the 2019 Indian ASAT weapon test, the most legally relevant aspects of which were the effort to avoid creating Space debris and the assurances to this effect provided to other states in advance. Again, this behaviour constitutes both state practice and evidence of *opinio juris* in favour of a developing rule of customary international law against ASAT weapon tests that create long-lasting debris. Further state practice and evidence of *opinio juris* came from the responses of other states, once it became clear that long-lasting debris had in fact been created.

Finally, there is the 2021 Russian ASAT weapon test, as discussed in the previous chapter and above. The test generated negative responses from many states, including all the major spacefaring states. These responses constitute state practice for the purposes of customary

[147] Gill and Kleiber, op. cit.
[148] See discussion, Chapter 7, section 7.6.

international law, while those that address the legality of the test or at least refer to the legal context will also constitute evidence of *opinio juris*. Just as importantly, not a single state responded to the Russian ASAT weapon test by saying that it was an appropriate or internationally legal action.

Perhaps most importantly, Russia strenuously denied that the test created dangerous Space debris, with its defence ministry stating, 'emerging fragments at the time of the test and in terms of the orbit's parameters did not and will not pose any threat to orbital stations, satellites and space activity'.[149] This constitutes an acknowledgement that the deliberate creation of long-lasting debris is unacceptable today, with the denial constituting both state practice and evidence of *opinio juris* in support of a developing rule of customary international law to this effect.

8.3 Non-kinetic Technologies

Developing rules on kinetic ASAT weapon testing is made easier by the existence of non-kinetic technologies that can disable satellites or interrupt their communications without creating Space debris. These can involve using a laser to 'dazzle' (temporarily interfere with) or 'blind' (permanently damage) the satellite's sensors, sending competing signals to 'spoof' (misdirect) or 'jam' (interrupt) the satellite's communications, or engaging in cyber actions such as 'hacking' (gaining access to the computing systems of the satellite or one of its ground stations).[150] They can also involve physical interference that does not involve violent impacts. All these technologies are broadly referred to as counterspace capabilities.

In 1997, the US Navy's Mid-Infrared Advanced Chemical Laser was tested against a US Air Force satellite.[151] Although it failed in its mission, a second, lower-power chemical laser was able to temporarily blind the satellite's sensors.[152] In 2006, China directed a laser at a US satellite,

[149] 'Russia's top brass reports on successfully striking defunct satellite in tests', op. cit.

[150] Todd Harrison, Kaitlyn Johnson, Zack Cooper and Thomas G Roberts, 'Escalation and deterrence in the second space age' (October 2017) Center for Strategic and International Studies (CSIS) Project Report, *CSIS*, online: www.csis.org/analysis/escalation-and-deterrence-second-space-age at 17.

[151] Matthew Mowthorpe, *The Militarization and Weaponization of Space* (Lanham, MD: Lexington Books, 2004) at 152.

[152] Ibid.

blinding the satellite for a few minutes.[153] Electronic interference has already occurred on occasion in geostationary orbit, when one satellite begins broadcasting on the same frequency as a nearby satellite, but it is not known whether this interference was intended.[154] Jamming is also used by multiple governments to prevent their citizens from accessing uncensored satellite television and Internet,[155] while in 2018 Russia jammed GPS signals to interfere with a NATO naval exercise in the Norwegian Sea.[156] More recently, in February 2022, Russian forces began jamming GPS signals in Ukraine.[157] Commenting on the situation, State Department official Eric Desautels said that 'the United States has our own communications jammer known as the CCS [Counter Communications System] ... We think that jamming is probably a normal part of conflict'.[158]

In recent years, Russia, the United States, China and the European Space Agency have all engaged in 'proximity missions' where they manoeuvre one spacecraft close to another spacecraft. Such exercises are often benign, indeed necessary, such as the docking of supply and crew change spacecraft with the International Space Station. Others can

[153] Michael P Pillsbury, 'An assessment of China's anti-satellite and space warfare programs, policies and doctrines' (19 January 2007) US–China Economic and Security Review Commission (USCC) Report, *USCC*, online: https://www.uscc.gov/research/assessment-chinas-anti-satellite-and-space-warfare-programs-policies-and-doctrines.

[154] Conference on Disarmament, *Report of the Conference on 'Building the Architecture for Sustainable Space Security' Held on 30–31 March 2006 in Geneva*, UN Doc CD/1786 (22 June 2006); Deborah Housen-Couriel, 'Disruption of satellite transmissions *ad bellum* and *in bello*: Launching a new paradigm of convergence' (2012) 45:3 *Israel Law Review* 431.

[155] See Pavel Velkovsky, Janani Mohan and Maxwell Simon, 'Satellite jamming: A technology primer' (3 April 2019), *CSIS*, online: res.cloudinary.com/csisideaslab/image/upload/v1565982911/on-the-radar/Satellite_Jamming_Primer_FINAL_pdf_bdzxwn.pdf; Peter B de Selding, 'Eutelsat blames Ethiopia as jamming incidents triple', *SpaceNews* (6 June 2014), online: spacenews.com/40818eutelsat-blames-ethiopia-as-jamming-incidents-triple/; Paul Sonne and Farnaz Fassihi, 'In skies over Iran, a battle for control of satellite TV', *Wall Street Journal* (27 December 2011), online: www.wsj.com/articles/SB10001424052970203501304577088380199787036.

[156] Ryan Browne, 'Russia jammed GPS during major NATO military exercise with US troops', *CNN* (14 November 2018), online: www.cnn.com/2018/11/14/politics/russia-nato-jamming/index.html.

[157] Theresa Hitchens, 'Satellite jamming "normal" by militaries during conflict, not peacetime: State Dept. official', *Breaking Defense* (21 March 2022), online: breakingdefense.com/2022/03/satellite-jamming-normal-by-militaries-during-conflict-not-peacetime-state-dept-official.

[158] Ibid.

be explained as involving research into 'on-orbit servicing' or 'active debris removal', with the latter including methods for capturing derelict satellites and other Space debris and sending them into re-entry or graveyard orbits – as discussed above. Of course, the same technology could be used for military purposes, to capture satellites or simply nudge them off course. But while such actions involve physical contact, in the absence of a violent impact they generally do not create Space debris, and for this reason are – for all practical and legal purposes – properly categorised as involving non-kinetic technologies rather than kinetic ASAT weapons.

There is no move to prohibit states from testing non-kinetic technologies against their own satellites, presumably because such tests pose no threat to other Space objects (provided control of the Space object is maintained). As for the deployment of non-kinetic technologies against satellites from other states, such actions are governed by the standard rules of international law on the use of force and on interference falling short of armed force. We will discuss these rules in the section on self-defence below.

As mentioned, cyber actions are another form of non-kinetic technology. Such actions might involve disrupting transmissions, corrupting data or even taking over a satellite's control systems to repurpose, shut down or direct it into a disadvantageous orbit.[159] Some states undoubtedly possess such capabilities already. China is suspected of having engaged in cyber actions against several US satellites, though the US government has never publicly attributed responsibility.[160] In February 2022, Russia was suspected of being behind a cyber action against the satellite company Viasat, which provides Internet connectivity in Ukraine.[161] Cyber actions against Space systems could be a serious problem, but the practical and legal constraints that apply to them are no different to those which apply to cyber actions directed at critical infrastructure on the Earth's surface, such as hospitals or electrical grids.

[159] David Livingstone and Patricia Lewis, 'Space, the final frontier for cybersecurity?' (22 September 2016) Chatham House research paper, online: www.chathamhouse.org/2016/09/space-final-frontier-cybersecurity.

[160] Anthony H Cordesman and Joseph Kendall, 'Chinese space strategy and developments' (18 August 2016) CSIS Report, *CSIS*, online: www.csis.org/analysis/china-space-strategy-and-developments at 28.

[161] Hitchens, 'Satellite jamming "normal" by militaries during conflict, not peacetime', op. cit.

For the most part, such actions are governed by the general rules on the use of force, including the right of self-defence.

8.4 ASAT Weapons and the Right of Self-Defence

A rule against ASAT weapon testing that creates long-lasting debris would not prohibit all uses of such weapons. Although an unprovoked strike against a foreign-owned or -registered satellite would always be illegal, a state could, conceivably, use an ASAT weapon in self-defence – in response to an armed attack either in Space or, perhaps more likely, on the surface of the Earth itself. The right of self-defence is a rule of customary international law affirmed in Article 51 of the UN Charter, which also applies in Space.[162] However, the right of self-defence includes the criteria of necessity and proportionality, and heightened awareness and concern about Space debris will change how these criteria are applied in the context of ASAT weapons.

Any use of an ASAT weapon against a foreign-owned or -registered satellite will violate the prohibition on the threat or use of force set out in Article 2(4) of the UN Charter, or alternatively, at a lower threshold, violate the general prohibition on interference with property under the

[162] Art. III of the Outer Space Treaty reads, 'States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations'. For recognition that the right of self-defence, specifically, extends to Space, see European External Action Service, 'EU proposal for an international space code of conduct, draft', op. cit., para. 26; Conference on Disarmament, *Letter dated 12 February 2008 from the Permanent Representative of the Russian Federation and the Permanent Representative of China to the Conference on Disarmament addressed to the Secretary-General of the Conference transmitting the Russian and Chinese texts of the draft 'Treaty on Prevention of the Placement of Weapons in Outer Space and the Threat or Use of Force against Outer Space Objects (PPWT)' introduced by the Russian Federation and China*, UN Doc CD/1839 (29 February 2008); Conference on Disarmament, *Letter Dated 10 June 2014 from the Permanent Representative of the Russian Federation and the Permanent Representative of China to the Conference on Disarmament addressed to the Acting Secretary-General of the Conference transmitting the Updated Russian and Chinese texts of the draft Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects (PPWT) Introduced by the Russian Federation and China*, UN Doc CD/1985 (12 June 2014); United States Department of Defense, 'Directive 3100.10 – space policy' (9 July 1999) at para. 4.2.1.

jurisdiction of a foreign state within customary international law.[163] But this is not the end of the matter, because Article 51 declares,

> Nothing in the present Charter shall impair the inherent right of individual or collective self-defence if an armed attack occurs against a Member of the United Nations, until the Security Council has taken measures necessary to maintain international peace and security.[164]

What constitutes an 'armed attack' with respect to satellites? Under what circumstances would targeting a satellite in response to an armed attack elsewhere, such as on the Earth's surface, fulfil the necessity and proportionality criteria within the right of self-defence? To answer these questions, we must turn again to customary international law – as the word 'inherent' in Article 51 instructs us to do – and, with that, the criteria of necessity and proportionality. How are these criteria applied to ASAT weapons? Is their application changing due to heightened awareness and concern about Space debris?

8.4.1 Armed Attack

A military vessel is treated as an extension of a state's territory; as a result, the use of force against such a vessel generally constitutes an 'armed attack' giving rise to a right of self-defence.[165] The use of force against a military satellite, therefore, should have the same consequence, subject to several contextual factors.[166] Whether any particular use of force constitutes an armed attack will, for example, depend upon its gravity. As the

[163] One could, of course, imagine scenarios where the foreign state explicitly consents to the use of an ASAT weapon against its satellite, with the United States' shooting down of its own malfunctioning hydrazine-laden satellite in 2008 providing an example of how such a situation could arise. In such a case, no violation of international law would occur.

[164] Charter of the United Nations, 26 June 1945, Can TS 1945 No 7 Art. 51 (entered into force 24 October 1945).

[165] Article 3(d) of the UN General Assembly Resolution on the Definition of Aggression includes 'An attack by the armed forces of a State on the land, sea or air forces . . . of another State.' *Definition of Aggression*, GA Res 3314(XXIX), UNGAOR, 29th Sess, 2319th Plen Mtg, UN Doc A/RES/29/3314(XXIX) (1974), Art. 3(d); Art. 6 of the North Atlantic Treaty provides for collective self-defence against 'an armed attack on the territory . . . or on the forces . . . of any of the parties.' North Atlantic Treaty, 4 April 1949, 34 UNTS 213 Art. 6 (entered into force 24 August 1949).

[166] Christopher M Petras, 'The use of force in response to cyber-attack on commercial space systems: Reexamining "self-defense" in outer space in light of the convergence of U.S. military and commercial space activities' (2002) 67:4 *Journal of Air Law and Commerce* 1213 at 1254–55.

International Court of Justice held in the *Nicaragua Case*, 'It is necessary to distinguish the most grave forms of the use of force (those constituting an armed attack) from other less grave forms.'[167]

This threshold for an armed attack is needed to help prevent small incidents from escalating into large conflicts, since the state being attacked may (if it respects the criteria of necessity and proportionality, as discussed below) respond to an armed attack by using force against elements of the attacking state's military that were not used in the initial attack. To illustrate the point, consider what happens when a missile system on a military vessel from one state 'locks on' to a military aircraft from another state. Although the act of locking on is considered to demonstrate hostile intent and could well constitute a violation of Article 2(4) as a threat to use force, it would not normally constitute an armed attack because the gravity threshold will not have been reached. As a result, the state subject to the locking on will not be entitled to use force in response, either against the military vessel or against additional elements of the other state's armed forces. It may, however, be entitled to engage in non-forceful 'countermeasures' (i.e. measures that would otherwise be contrary to international law, but which are permitted if taken in response to an internationally wrongful act in order 'to procure cessation and reparation').[168]

Border incursions, where a small number of troops briefly cross into the territory of another state, are treated in a similar manner. In the *Nicaragua Case*, the Court explained that 'scale and effects' are what distinguish an armed attack from a 'mere frontier incident'.[169] The gravity requirement was reaffirmed in the subsequent *Oil Platforms Case*, where the Court held that Iran's deployment of a mine without the specific intent to damage a US military vessel was insufficiently grave to constitute an armed attack.[170]

[167] *Military and Paramilitary Activities in and against Nicaragua* (*Nicaragua* v. *United States*), [1986] ICJ Rep 14 at 101, para. 191.

[168] 'Draft Articles on the Responsibility of States for Internationally Wrongful Acts', in *Responsibility of States for Internationally Wrongful Acts*, GA Res 56/83, UNGAOR, 56th Sess, 85th Plen Mtg, UN Doc A/RES/56/83 Annex (28 January 2002) at Part Three, ch. II (Countermeasures), online: undocs.org/en/A/RES/56/83.

[169] *Military and Paramilitary Activities in and against Nicaragua* (*Nicaragua* v. *United States*), [1986] ICJ Rep 14 at 103, para. 195.

[170] *Oil Platforms* (*Iran* v. *United States*), [2003] ICJ Rep 161 at 195, para. 72. However, in the same paragraph, the Court expressly did 'not exclude the possibility' that the planting of a mine, which subsequently struck a single military vessel, 'might be sufficient to bring into play "the inherent right of self-defense".'

Now consider how the gravity requirement might apply to actions taken against a foreign military satellite in peacetime. What if the satellite were only temporarily disabled by dazzling or jamming? Or what if the satellite were destroyed by a missile but there was no direct loss of life or significant damage to assets or people on the ground? At first glance, neither situation would reach the gravity threshold for an 'armed attack' and thus trigger the right of self-defence. However, it is unlikely that any use of a kinetic ASAT weapon against a military satellite would be directed solely at the machinery of the satellite. It would, most likely, also be directed at degrading the situational awareness, communications and control of armed forces on the ground – in other words, core military capabilities made possible by the satellite. Since the use of kinetic ASAT weapons against military satellites would almost always be directed at these core capabilities, the scale and effects of their use would almost always reach the gravity threshold and constitute an armed attack.

The same logic – focusing on the scale and effects of the strike on military capabilities, rather than on the satellite itself – could lead to the conclusion that strikes against dual-use satellites might also constitute armed attacks, even if the satellites are owned by private companies. That said, some dual-use satellites might only provide occasional service to military customers. The fact that a satellite is dual-use will not determine whether a strike against it constitutes an armed attack. What matters is the scale and effects of the use of force in terms of its impact on the targeted satellite's contributions to a state's military activities.

The analysis becomes even more difficult with purely civilian satellites that form no part of a state's military apparatus, but in many cases constitute key economic infrastructure or serve as tools for search and rescue and disaster relief. International law has addressed this issue in the past, albeit in the context of oceans rather than Space: a military action against a single civilian vessel will not usually constitute an armed attack, but a military action against an entire merchant fleet could.[171] Similarly, cyber actions against civilian computers can constitute an armed attack, but only if they cause significant economic damage or imperil essential

[171] Art. 3(d) of the UN General Assembly Resolution on the Definition of Aggression refers to an attack on the 'marine and air fleets of another State'. For a comprehensive discussion, see Tom Ruys, *Armed Attack and Article 51 of the UN Charter: Evolutions in Customary Law and Practice* (Cambridge: Cambridge University Press, 2010) at 204–11.

state functions such as power grids, hospitals or air traffic control.[172] Applying the same logic to civilian satellites, an action that causes economic damage or imperils essential functions could be considered an armed attack, provided the scale and effects are serious enough.[173]

This conclusion raises further, highly context-dependent issues of redundancy and resilience, since some states are better able than others to withstand the loss of one satellite or a small number of them. Does a state with many civilian satellites have a higher threshold for suffering an armed attack, given that any satellites that are not targeted could continue providing economic and essential services? The answer would seem to be yes, though it is impossible to identify the exact number or percentage of satellites that would need to be lost before a right of self-defence would arise. Each situation will have to be assessed on its own terms, and again, a consideration of scale and effects will be determinative. It is clear, however, that militaries developing satellite constellations to provide redundancy for security purposes are *reducing* the chances of the threshold of 'armed attack' being achieved. Satellite constellations might thus help to prevent escalations for any single attack. Attacks designed to disable entire constellations, though, will need to be considered differently.

Even if a particular use of an ASAT weapon against a satellite constitutes an 'armed attack' and thus triggers a right of self-defence, this does not give the attacked state *carte blanche* in its response. The right of self-defence includes the criteria of necessity and proportionality, which limit the type and scale of any permissible reaction.

8.4.2 *Necessity and Proportionality*

As the International Court of Justice held in the *Nicaragua Case*, 'whether the response to the [armed] attack is lawful depends on

[172] James P Farwell and Rafal Rohozinski, 'Stuxnet and the future of cyber war' (2011) 30:1 *Survival* 23 at 30; Burkadze, op. cit.

[173] Christopher M Petras argues that *any* attack on a commercial satellite gives rise to a right of self-defence. Focusing on the fact that the Outer Space Treaty requires each state to maintain a national registry of satellites and retain jurisdiction over them, he writes, 'just as the right of the State to forcefully defend vessels attacked on the high seas extends to all vessels registered in the State (i.e., without regard to whether the vessel that is the target of the attack is a State or private instrumentality), so too must the State's right to defend satellites in space apply equally to all satellites carried on its national registry, including commercial satellites.' Petras, op. cit. at 1256.

observance of the criteria of the necessity and the proportionality of the measures taken in self-defence'.[174] Applying these criteria – essentially balancing the reasons for taking military action against its negative impacts on other states as well as civilians – is always a fact-specific exercise. For this reason, as Christine Gray explains, 'There was until recently relatively little general academic discussion of these essential characteristics of self-defence, as opposed to discussion in application to particular incidents.'[175] It is possible, however, to make two general observations about the application of necessity and proportionality to ASAT weapons that lead to specific conclusions.

First, when it comes to necessity and proportionality applied to ASAT weapons, the armed attack and the response might well occur in different domains. It is possible that both the armed attack and the response will occur in Space. For instance, a satellite operated by one state might be used to attack a satellite operated by another state, and in response the state that has been attacked destroys either the attacking satellite (if it was not initially destroyed) or another satellite operated by the aggressor state. Alternatively, it is also possible that the state that has been attacked in Space will engage in a 'cross-domain' response directed at targets on Earth, such as a satellite ground station belonging to the aggressor state. However, the most likely scenario is that the armed attack will occur on Earth and the responding state will engage in a cross-domain response in Space, targeting one or more satellites to interrupt the aggressor state's situational awareness, communications and control. As we will see below, factors specific to one domain, such as Space debris, can influence the application of the criteria of necessity and proportionality in ways that do not occur in another domain.

[174] *Military and Paramilitary Activities in and against Nicaragua* (*Nicaragua* v. *United States*), [1986] ICJ Rep 14 at 103, para. 194. See also *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion, [1996] ICJ Rep 226 at 245, para. 41; *Oil Platforms* (*Iran* v. *United States*), [2003] ICJ Rep 161 at 198, para. 76; *Armed Activities on the Territory of the Congo* (*Democratic Republic of the Congo* v. *Uganda*), [2005] ICJ Rep 168 at 223, para. 147.

[175] Christine Gray, *International Law and the Use of Force*, 4th ed. (Oxford: Oxford University Press, 2018) at 159. The recent discussions concern terrorism and other use-of-force situations on the Earth's surface. They include David Kretzmer, 'The inherent right to self-defence and proportionality in jus ad bellum' (2013) 24:1 *European Journal of International Law* 235; Dapo Akande and Thomas Liefländer, 'Clarifying necessity, imminence, and proportionality in the law of self-defense' (2013) 107:3 *American Journal of International Law* 563.

Second, it is not easy to apply the criteria of necessity and proportionality in the context of ASAT weapons. One might, for example, see an analogy between military and dual-use satellites, on the one hand, and remotely-controlled communications towers and radar facilities, on the other, in that taking military action against a satellite could not only disable a potential adversary's situational awareness, communications and control, but also do so without causing direct casualties. However, the analogy does not hold, because military and dual-use satellites have distinctive attributes.

8.4.2.1 Military Satellites

The importance of satellites for modern militaries would be difficult to exaggerate. They contribute to core military capabilities such as surveillance, situational awareness, communications and control and targeting. Thus, when engaging in an armed response against Space-based assets, the criteria of necessity and proportionality must be applied to balance the central importance of military and dual-use satellites against the damage caused by an armed attack. Just like destroying the main military headquarters of a state would be a disproportionate response to most armed attacks, destroying military satellites that support surveillance, situational awareness, communications and control and targeting capabilities would also be disproportionate – in most cases. Like the need to consider the scale and effect of the initial military action when determining whether it amounts to an armed attack, one needs to consider whether a responsive disablement or destruction of a satellite or satellites has disproportionate consequences.

Disproportionate consequences might include more than consequences for military capabilities. States direct very large amounts of money and effort to the development, launch, maintenance and protection of their military satellites, money that might otherwise have been spent on more traditional military equipment and personnel.[176] Some US military satellites are as large as a school bus and cost more than US$1

[176] For example, the global positioning system cost US$10 billion–12 billion to establish. Rick W Sturdevant, 'NAVSTAR, the global positioning system: A sampling of its military, civil, and commercial impact', in Steven J Dick and Roger D Launius, eds., *Societal Impact of Spaceflight* (NASA: Washington, DC, 2007) 331 at 332, online: history.nasa.gov/sp4801-part2.pdf. Satellites are still added to the system periodically, increasing the overall cost.

billion to construct and launch.[177] Arguably, both the importance of military satellites and their considerable expense must be taken into account with regard to the criteria of necessity and proportionality, so as to avoid introducing an excessively punitive element into any self-defence action involving ASAT weapons.

8.4.2.2 Dual-Use Satellites

Many satellites are dual-use in that they serve civilian as well as military functions. For instance, the global positioning system (GPS) was developed for military purposes and is provided by US military satellites. However, it has become an essential service for commercial aviation and shipping, financial services and the personal travel of billions of people, who are connected to the service via their mobile phones and automobiles.[178]

At the same time, militaries constitute some of the largest customers of commercial satellite services.[179] More than 80 per cent of the communications resources currently used by the US military in overseas operations are supplied by commercial satellites. Even some of the bandwidth used for the operation of US armed drones comes from commercial providers.[180] The US military also purchases large amounts of Earth-imaging data collected by commercial satellites, often from other countries. To provide just one example, RadarSat-2, a synthetic aperture radar satellite built and launched by a Canadian private company with financial support from the Canadian government, has been heavily used by the US military – to the point where a bilateral treaty was deemed necessary.[181]

[177] According to a 2015 report, Lockheed Martin was seeking to reduce the cost of military satellites to US$1.1 billion each. Andrea Shalal, 'Lockheed seeks to cut costs of U.S. military satellites', *Reuters* (16 March 2015), online: www.reuters.com/article/us-lockheed-satellites-idUSKBN0MC20W20150316.

[178] Sturdevant, op. cit. at 332.

[179] Greg Berlocher, 'Military continues to influence commercial operators', *Satellite Today* (1 September 2008), online: www.satellitetoday.com/publications/via-satellite-magazine/supplement/2008/09/01/military-continues-to-influence-commercial-operators.

[180] Andrew A Adams and Rachel J McCrindle, *Pandora's Box: Social and Professional Issues of the Information Age* (Chichester: John Wiley & Sons, 2008) at 253.

[181] Agreement between the Government of Canada and the Government of the United States of America Concerning the Operation of Commercial Remote Sensing Satellite Systems, 16 June 2000, Can TS 2000 No 14 (entered into force 16 June 2000), online: www.treaty-accord.gc.ca/text-texte.aspx?id=103522. An unpublished annex to the treaty is rumoured to provide the US with 'priority access' as well as 'shutter control', i.e. the ability to deny access to others.

The US and other militaries also use commercial facilities for downloading data from satellites. The largest such facility, located at 78 degrees north on the Svalbard archipelago, is owned and operated by Kongsberg Satellite Services (KSAT) and connected to the Norwegian mainland by two fibre optic cables that were paid for mostly by the US government.[182] As a whole, the US government is the world's single largest consumer of commercial satellite services, spending US$1.34 billion in 2015.[183] The militaries of other countries are also increasingly dependent on civilian satellites. As David Koplow explains, 'The clear trend around the world is for ever-increasing integration of military and civilian space programs and assets.'[184]

Applying the criteria of necessity and proportionality to dual-use satellites will always be difficult. Will the necessity requirement be fulfilled if a state responds to an armed attack by targeting military communications satellites, while knowing that its opponent can quickly obtain the same services from commercial satellites? Could the proportionality requirement be fulfilled if the commercial satellites are then targeted, given the negative economic and other impacts on civilians that are likely to result? Even attacks on military satellites could have civilian impacts exceeding the limits of proportionality; consider for example the consequences that would result from targeting GPS satellites.

Then there is the issue of satellites used for national technical means (NTMs) of verification under arms control treaties.[185] Although these satellites fulfil other functions, including providing Earth imaging to military forces, targeting one or more of them could be a matter of real

[182] Steven M Buchanan, Jayson W Cabell and Daniel C McCrary, *Acquiring Combat Capability through Innovative Uses of Public Private Partnerships* (MBA professional report, Naval Postgraduate School, 2006) at 11–12, online: calhoun.nps.edu/handle/10945/384.

[183] 'US government and military satellite market 2017, forecast to 2022: The US government accounted for $1.34 billion in purchases of commercial satellite services – research and markets', *PRNewswire* (20 January 2017), online: www.prnewswire.com/news-releases/us-government-and-military-satellite-market-2017-forecast-to-2022-the-us-government-accounted-for-134-billion-in-purchases-of-commercial-satellite-services—research-and-markets-300394107.html.

[184] David A Koplow, 'ASAT-isfaction: Customary international law and the regulation of anti-satellite weapons' (2009) 30 *Michigan Journal of International Law* 1187 at 1194.

[185] David A Koplow, 'An inference about interference: A surprising application of existing international law to inhibit anti-satellite weapons' (2014) 35:3 *University of Pennsylvania Journal of International Law* 737 at 768–81.

consequence for international peace and security. Applying the criteria of necessity and proportionality in these circumstances would be challenging indeed.

Once the full range of military and civilian impacts are included in an assessment of ASAT weapons and the right of self-defence, it becomes clear that most satellites are not the necessary, proportionate, low-collateral-effects targets they might seem at first glance. Some satellites are low-impact and therefore unnecessary targets because of the redundancy and resiliency provided by other satellites, including commercial ones. Other satellites are high-collateral-effects targets because of their importance to search and rescue, disaster relief, shipping, aviation, agriculture, fisheries and other core economic activities. Much will depend on what a particular satellite is used for, and in almost all circumstances the criteria of necessity and proportionality will be difficult to fulfil.

8.4.2.3 Self-Defence and Space Debris

The military and civilian effects of an ASAT weapon could be greatly magnified if it creates long-lasting Space debris, thus imperilling other satellites and contributing to the risk of knock-on collisions (i.e. the Kessler–Cour-Palais syndrome). In a worst-case scenario, the use of ASAT weapons could result in the loss of access to portions of low Earth orbit, including for Earth-imaging satellites essential for global food security and disaster relief. These and other impacts might well preclude future Space applications that have yet to be discovered and developed, at least for some time. Perhaps most importantly, many of these negative consequences would affect third states – that is, states not involved in the circumstances giving rise to the decision to use an ASAT weapon.

The international responses to the 2007 Chinese, 2019 Indian and 2021 Russian ASAT weapon tests and surrounding changes in the practice of states demonstrate heightened awareness and concern about Space debris, to the point where it becomes difficult to imagine any use of an ASAT weapon in a manner that created long-lasting debris being considered necessary and proportionate. This development, it should be noted, is not driven by any change in the law of self-defence, but rather a change in knowledge that affects its application. In other words, states now know that a single fragmentation event can create tens of thousands of pieces of Space debris that will imperil other satellites, including civilian satellites, dual-use satellites, NTM satellites and satellites belonging to other states, with potentially serious consequences for otherwise uninvolved

states, companies and ordinary people. Even India, which sought to test a ground-based missile as an ASAT weapon without creating long-lasting Space debris, failed in that effort and created debris. In the context of necessity and proportionality, this developing knowledge is decisive. Accordingly, most uses of ASAT weapons that involve kinetic impacts are today unlikely to meet the criteria for self-defence under international law.

8.5 ASAT Weapons and International Humanitarian Law

The use of kinetic ASAT weapons could also violate the *jus in bello*, which is the body of law that applies to all sides once an armed conflict has begun. Also known as the 'law of armed conflict' or 'international humanitarian law', it seeks to limit the human suffering that is the inevitable consequence of war. The rules of the *jus in bello* are codified within a series of multilateral treaties, primarily The Hague Conventions of 1907, the Geneva Conventions of 1949 and the Additional Protocols of 1977,[186] which are complemented by a parallel body of customary international law.[187]

In this section, we consider how the core *jus in bello* principles of military necessity, distinction and proportionality apply in an increasingly busy orbital environment that includes satellite mega-constellations, Space debris and a growing risk of knock-on collisions. More specifically, we ask whether the heightened risks posed to civilians – through the potential loss of satellites supporting food production, disaster relief and other essential services – lead to the conclusion that the *jus in bello* precludes the extension of ground-based conflicts to Space via kinetic ASAT weapons today.

8.5.1 *Military Necessity*

The principle of military necessity is central to the *jus in bello*. In the words of Article 52(2) of Additional Protocol I to the Geneva Conventions, belligerents may lawfully target 'those objects which by their nature,

[186] See International Committee of the Red Cross (ICRC), 'Treaties, state parties and commentaries' (2022), *ICRC IHL Databases*, online: ihl-databases.icrc.org/applic/ihl/ihl.nsf.

[187] See ICRC, 'Customary IHL Database' (2005), *ICRC IHL Databases*, online: ihl-databases.icrc.org/customary-ihl/eng/docs/home.

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location, purpose or use make an effective contribution to military action and whose total or partial destruction, capture or neutralization, in the circumstances ruling at the time, offers a definite military advantage'.[188] Military satellites could well qualify as such objects under this legal definition. So too might some dual-use satellites, if they are being employed by an adversary for military purposes including communications, situational awareness or targeting.

8.5.2 *Distinction*

The principle of distinction is also central to the *jus in bello*, with Additional Protocol I prohibiting indiscriminate attacks, including those that 'employ a method or means of combat which cannot be directed at a specific military objective'[189] or 'may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated'.[190]

As Bill Boothby explains,

> a space weapon is unlawful if, when used in its normal or designed circumstances, it cannot be directed at a specific military objective or if its effects cannot be reasonably restricted to the target, and, if as a result, its nature is to strike lawful targets, such as military objectives, and protected persons and objects without distinction.[191]

Boothby concludes that ASAT weapons 'that are likely to cause debris clouds in areas of outer space that civilian satellites may be expected to use are likely to be regarded as breaching the indiscriminate attacks rule'.[192] We further note, as discussed in the previous chapter, that a fragmentation event at one orbital altitude will affect a broad range of altitudes, such that it is infeasible to distinguish military orbital Space from civilian orbital Space. Indeed, such a distinction does not exist.

[188] Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts, 8 June 1977, 1125 UNTS 3 (7 December 1978) (Additional Protocol I).
[189] Ibid., Art. 51(4)(b).
[190] Ibid., Art. 51(5)(b).
[191] Bill Boothby, 'Space weapons and the law' (2017) 93 *International Law Studies* 179 at 187–88.
[192] Ibid. at 208.

8.5.3 *Proportionality*

A third core principle of the *jus in bello* is proportionality – between military advantage on the one hand and the protection of civilians and civilian objects on the other. This long-standing rule of customary international law also finds expression in Additional Protocol I, with Article 57 (2)(a) stipulating that 'those who plan or decide upon an attack shall':

(ii) take all feasible precautions in the choice of means and methods of attack with a view to avoiding, and in any event to minimizing, incidental loss of civilian life, injury to civilians and damage to civilian objects;
(iii) refrain from deciding to launch any attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated.

Today, the principle of proportionality must be applied to ASAT weapons within the context of an increasingly busy orbital environment, Space debris and the risk of knock-on collisions, as well as the severe consequences for civilians that would result from the loss of essential satellite services. We can only conclude that the use of an ASAT weapon in a manner that creates long-lasting Space debris would be disproportionate and therefore illegal under the *jus in bello*.

Sometimes, the principle of proportionality can require states to choose different kinds of weapons, or different targets. APV Rogers provides an example of proportionality at work in the planning of a US airstrike on a hydroelectric dam during the Vietnam War:

> [The dam] was estimated to supply up to 75 per cent of Hanoi's industrial and defense needs. On the other hand, it was thought that if the dam at the site were breached, as many as 23,000 civilians could die, presumably in the resultant floods. President Nixon's military advisers said that if laser-guided bombs were used there was a 90 per cent chance of the mission's being accomplished without breaching the dam. On that basis, the President authorized the attack, which successfully destroyed the electricity generating plant without breaching the dam.[193]

In other words, the principle of proportionality required the United States to choose a different kind of weapon to reduce the risk of civilian

[193] APV Rogers, *Law on the Battlefield*, 3rd ed. (Manchester: Manchester University Press, 2012) at 22, citing W Hays Parks, 'Air war and the law of war' (1990) 32 *Air Force Law Review* 1 at 168–69.

harm. Michael Schmitt has explained how the same rebalancing might operate in the context of ASATs:

> In strikes against space-based assets, the primary concern in this regard is . . . creation of space debris. As a result, an attacker might be required to employ a soft kill technique, such as computer network attack, in lieu of kinetic means if the former would result in less collateral damage while yielding a similar military advantage.[194]

As for the choice of targets, the awkwardly worded Article 57(3) of Additional Protocol I states, 'When a choice is possible between several military objectives for obtaining a similar military advantage, the objective to be selected shall be that the attack on which may be expected to cause the least danger to civilian lives and to civilian objects.' On this, Schmitt writes,

> As an example, if a satellite can be reliably neutralized through a strike on a ground-based control node in a remote area, it would not be permissible to attack the satellite kinetically and thereby create dangerous space debris. Much like attacks against terrestrial targets, space warfare necessitates deconstructing space systems to make such determinations.[195]

Again, the principle of proportionality could rule out the use of ASAT weapons involving violent impacts, and push states towards other types of weapons and other types of targets.

For all these reasons, we agree with the International Committee of the Red Cross. In 2021, the ICRC submitted a position paper to the secretary general of the United Nations in which it wrote, 'When assessing the lawfulness of such [ASAT weapon] attacks, all foreseeable direct and indirect incidental harm or damage to civilian objects must be considered, including when targeting a dual-use space object. The risk of creating debris and its indirect effects . . . should also be considered when applying these rules.'[196]

It is difficult to imagine circumstances where a kinetic ASAT weapon could be used without violating the *jus in bello*, which, again, is often referred to as international humanitarian law.

[194] Michael N Schmitt, 'International law and military operations in space' (2006) 10 *Max Planck Yearbook of United Nations Law* 89 at 120–21.

[195] Ibid. at 121.

[196] ICRC, 'The potential human cost of the use of weapons in outer space and the protection afforded by international humanitarian law' (2021), position paper submitted by the ICRC to the secretary general of the United Nations on the issues outlined in General Assembly Resolution 75/36, *ICRC*, online: www.icrc.org/en/document/potential-human-cost-outer-space-weaponization-ihl-protection.