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Main Text:

A. Context

1. This entry sets out the international law applicable to military uses of outer space. As well as being a physical domain, outer space is a legal domain in which international law applies (→Space Law). Its precise physical and legal boundaries with →airspace remain subject to debate and are internationally undefined (see →Outer Space for an overview of the debate and attempts to delimit outer space). In November 2019, NATO declared outer space to be an operational military domain. Several States have recently established a space force military branch, including the United States of America ('USA'), Russia, the People's Republic of China, Iran, France and Spain. The United Kingdom established its Joint Space Command in 2021. An increasing number of States are developing counterspace capabilities including anti-satellite ('ASAT') weapons. At the 2021 Brussels Summit, NATO leaders recognised that 'attacks to, from, or within space present a clear challenge to the security of the Alliance, the impact of which could threaten national and Euro-Atlantic prosperity, security, and stability, and could be as harmful to modern societies as a conventional attack' (NATO, Brussels Summit Communiqué Issued by NATO Heads of State and Government (2021) (14 June 2021), para. 33.).

2. Military uses of outer space at present principally concern satellites (→Spacecraft, Satellites, and Space Objects) and the testing and use of ASAT and other space weapons and their stationing in outer space or on celestial bodies. Satellites have important military functions and are also of increasingly critical importance to civilians.

a) Military functions of satellites

3. Military functions of satellites include intelligence, surveillance and reconnaissance (ISR) and positioning, navigation and timing (PNT). Satellite ISR provides States with situational awareness prior to or during an armed conflict, including troop movement, deployment of heavy weaponry, intercept communications and may provide early warning of an impending attack. Satellite PNT allows for coordination of military activities including navigation and weapons guidance. Satellites are also central to the verification of adherence to arms control treaties and are referred to in some treaties as national technical means of verification.

b) Civilian dependence on satellites

4. Civilians worldwide are increasingly reliant on space systems, including for food production, health care, search and rescue, communications, environmental science and the global navigation satellite systems such as GPS, Beidou, Galileo and GLONASS, which themselves underpin banking, financial markets and energy grids. Satellites also play an essential humanitarian role including in disaster emergency response and humanitarian relief, due to their function in providing information about weather during and after a disaster, communication and navigation satellites to support logistical operations, and Earth observation satellites to allow the planning and coordination of emergency and humanitarian relief (ICRC, *The Potential Human Cost of the Use of Weapons in Outer Space and the Protection Afforded by International Humanitarian Law,* (9 April 2021), 2.). The International Committee of the Red Cross has noted '[t]he human cost of using weapons in outer space that could disrupt, damage, destroy or disable civilian or dual-use space objects is likely to be significant' (ibid, 1).

c) Vulnerability of satellites to attack

5. Due to their visibility, predictable paths, limited manoeuvrability, fragility and low defensibility, satellites are highly vulnerable to attack and other forms of interference (David Wright, Laura Grego and Lisbeth Gronlund, *The Physics of Space Security: A Reference Manual* (American Academy of Arts and Sciences, 2005), 109.). The high speed of satellites (about 17,500 km/hr in low Earth orbit) renders them vulnerable to destruction by collision with small objects on different orbits. Satellite systems have several components that are each vulnerable to interference and attack, namely the ground station on Earth which operates and controls the satellite, the satellite in orbit and the links between the two (ibid). These interventions can be launched from Earth (ground) or space, and may consist of ground to ground (Earth-based attacks on satellite ground stations), ground to space (attacks launched from Earth to space), or space to space (on-orbit ASAT attacks, e.g. a satellite releasing an object which will collide with another satellite). ASAT interference or attacks may be kinetic (e.g. direct ascent ASAT ('DA-ASAT')) or non-kinetic, such as the use of lasers, electromagnetic interference (including orbital jamming, terrestrial jamming, hijacking, spoofing or scanning) and cyber operations. Attacks and interference may render the satellite permanently impaired or destroyed ('kill', or destruction) or have temporary and reversible effects ('soft kill', or denial, disruption or degradation).

d) ASAT tests

6. China, the USA, India and Russia (and before that, the Soviet Union) have conducted destructive ASAT tests. China conducted such a test in 2007, destroying one of its own weather satellites and creating several thousand trackable pieces of space debris. The USA conducted a DA-ASAT test in 2008, creating more than 400 pieces of trackable debris. India did so in 2019, creating a similar amount of trackable debris. In 2021, Russia launched an unannounced DA-ASAT missile test to destroy one of its own defunct satellites, forcing astronauts and cosmonauts aboard the International Space Station to seek shelter in their hardened Crew Dragon and Soyuz capsules from the thousands of trackable pieces of space debris that were created.

e) Space debris

7. A major problem with kinetic ASAT weapons is the side effect of creating →space debris. Even small pieces of space debris can destroy other space objects due to the often-high relative velocities of objects in orbit. Risks from space debris are increasing due to a rapidly changing orbital environment characterised by higher congestion including from abandoned rocket bodies and satellite mega-constellations. In the worst case, space debris can trigger the Kessler Syndrome, a collisional cascade that could make some orbits unsafe to access and use for decades (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* 2637). The clear dangers of space debris have led both to calls for a treaty banning kinetic ASAT testing and to unilateral declarations by a growing number of States including the USA, Canada, Germany, New Zealand, the United Kingdom ('UK'), Japan and Australia committing to refrain from such testing. In December 2022 the UN General Assembly adopted a resolution calling on States to commit not to conduct destructive DA-ASAT missile tests (*Resolution 77/41* (12 December 2022), UN Doc. A/RES/77/41, para. 1).

B. International law applicable to military uses of outer space

International law, including the →United Nations Charter, is applicable to outer space and celestial bodies. This has been affirmed in numerous treaties and UN General Assembly resolutions, beginning with Resolution 1721A (XVI) of 20 December 1961 and recently in Resolution 75/36 of December 2020 on reducing space threats through norms, rules and principles of responsible behaviours. In Resolution 75/36, the General Assembly affirmed that 'all States must conduct their activities in the exploration and use of outer space, including the Moon and other celestial bodies, in conformity with international law, including the Charter of the United Nations' (para. 1). Article III of the Outer Space Treaty ('OST') similarly provides that '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, in the interest of maintaining international peace and security and promoting international co-operation and understanding.' Article 103 of the UN Charter provides that '[i]n the event of a conflict between the obligations of the Members of the United Nations under the present Charter and their obligations under any other international agreement, their obligations under the present Charter shall prevail.'

Of the five main outer space treaties (→ Space law), the 1967 OST and the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies ('Moon Agreement') contain explicit provisions on the military uses of outer space. The other outer space treaties are the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space ('Rescue Agreement'); the 1972 Convention on International Liability for Damage Caused by Space Objects ('Liability Convention') and the 1975 Convention on Registration of Objects Launched into Outer Space ('Registration Convention').

a) Outer Space Treaty

The key provisions of the Outer Space Treaty relating to military uses of outer space are articles III (mentioned above), IV(1) and (2) and IX.

(i) Nuclear weapons and weapons of mass destruction

Under Article IV(1), 'States Parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.' The OST does not prohibit placement of weapons in space apart from nuclear weapons and → weapons of mass destruction and does not prohibit the testing or use of conventional weapons in outer space.

(ii) Peaceful purposes

Article IV(2) states that the Moon and other celestial bodies shall be used 'exclusively for peaceful purposes'. Expressly forbidden under this article are '[t]he establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies', whereas '[t]he use of military personnel for scientific research or for any other peaceful purposes' is not prohibited.

There is a clear distinction between article IV(1) and (2) of the OST in terms of zone of applicability and prohibited activities in that zone. Whereas article IV(1) refers to the entirety of outer space, article IV(2) only applies to 'the Moon and other celestial bodies' and not to 'outer void space' (the expanses between celestial bodies) (Bin Cheng, *Studies in International Space Law* (Oxford University Press, 1997), 518). The *travaux préparatoires* indicate that this omission was intentional (Carl Quimby Christol, *The Modern International law of Outer Space* (Elsevier, 1982), 24). The effect of this difference is that 'under both general international law and Article IV(1) of the 1967 Treaty, States are perfectly entitled to use the whole of outer space for military purposes, bar the stationing of nuclear weapons and weapons of mass destruction' (Cheng, 518) but the Moon and other celestial bodies are reserved 'exclusively for peaceful purposes'.

There is an ongoing controversy over whether →peaceful purposes in the OST means non-military or non-aggressive (Cheng, 528 - 532; F. Tronchetti, 'Legal aspects of the military uses of outer space' in F. G. von der Dunk (ed.), *Handbook of Space Law* (Elgar, 2015), 339; R. Wolfrum, 'The Problems of Limitation and Prohibition of Miltiary Use of Outr Space' (1984) *Zeitschrift für ausländisches öffentliches Recht und Völkerrecht* 22, 787-8); in other words, whether article IV(2) completely demilitarises (→demilitarization) the Moon and other celestial bodies, or if it merely confirms the applicability of the *jus ad bellum* in outer space. Those taking the former position point to the meaning of this term in article 1 of the 1959 Antarctic Treaty as 'non-military' and conclude that the meaning appears to be the same (Cheng, 519). The International Atomic Energy Agency Statute also supports this interpretation due to distinguishing between peaceful and military use of atomic energy (Wolfrum, 788). Those taking the position that 'peaceful purposes' means 'non-aggressive' argue that the 'non-military' interpretation is not supported by the subsequent practice of States parties or the *travaux préparatoires* (Tronchetti, 339). Michael Schmitt states that '[m]ost space-faring nations take the position that "peaceful" means "non-aggressive or non-hostile' ('International law and military operations in space' (2006) 10 *Max Planck Yearbook of United Nations Law* 89, 101).

(iii)Due regard and harmful interference

Article IX sets out the obligation of States parties to conduct their activities in outer space with due regard for the interests of other States parties. However, the interpretation of 'due regard' in this context is legally uncertain. States must undertake prior consultations before proceeding with an activity which may cause 'potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space'. The rules of the International Telecommunications Union set out in its Constitution and Radio Regulations (No. 1.166) prohibit harmful radio interference, 'which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with the Radio Regulations'. However, this does not apply to military radio installations due to exceptions in the International Telecommunications Union Constitution (arts. 6(1) and 48(1)).

(iv) Attribution

Article VI sets out a special regime of attribution in outer space. It holds that 'States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty.' It is legally uncertain whether this rule displaces the customary international law rules of →State responsibility regarding attribution of conduct to a State (International Law Committee, *Draft Articles on Responsibility of States for Internationally Wrongful Acts* (2001), chapter II), including with regard to uses of force and armed attacks in outer space. If it does, this could result in the acts of non-State actors (including commercial satellite operators) giving rise to violations by their State of registration of *jus ad bellum* or the law of neutrality or amount to hostilities under international humanitarian law. Alternatively, article VI can be interpreted to establish a separate regime of State responsibility under the OST solely for the purposes of liability. Under this regime, a State will be *liable* for damage to another State's space objects resulting from the former's military activities in outer space. This interpretation is consistent with the adoption of the Liability Convention, which elaborates on the OST, just five years later. (On the overlap between State responsibility and liability in outer space, see Frans von der Dunk, 'Liability versus Responsibility in Space Law: Misconception or Misconstruction?', (1992) *Proceedings of the 34th Colloqium on the Law of Outer Space* 363.)

b) Moon Agreement

The Moon Agreement applies to the moon and other celestial bodies in the solar system other than Earth (article 1(1)). Article 3(1) states that '[t]he moon shall be used by all States Parties exclusively for peaceful purposes.' Article 3(2) expressly applies the prohibition of the threat or use of force on the moon and prohibits using the moon itself to commit a threat or use of force or to threaten a hostile act 'in relation to the earth, the moon, spacecraft or their personnel or manmade space objects'. Article 3(3) prohibits placement of nuclear weapons and other weapons of mass destruction on or in orbit around the moon. Article 3(4) forbids '[t]he establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on the moon'. It is important to note that the Moon Agreement has a very low number of parties: eighteen States have ratified the treaty as of August 2023 (although one of them, Saudi Arabia, has given notice of withdrawal), and major spacefaring nations such as USA, China and Russia are not signatories.

c) Other relevant treaties

Other treaties of particular relevance to military uses of outer space are the 1945 United Nations Charter (articles 2(4), 51 and Chapter VII); the 1963 Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water (articles 1 and 4); the Constitution of the International Telecommunications Union (articles 45 and 48) and international humanitarian law treaties including the 1949 Geneva Conventions and their Additional Protocols and the 1976 Convention on the Prohibition of Military or Any Hostile Use of Environmental Modification Techniques ('ENMOD Convention') (articles 1 and 2).

d) Customary international law

→Customary international law also applies in outer space. This includes *jus ad bellum* rules that are also customary in nature, such as the prohibition of threat or use of force between States (→Use of force, prohibition of) and the right to →Self-defence in response to an armed attack (subject to the requirements of necessity and proportionality), and customary international humanitarian law (*jus in bello*) rules.

C. Jus ad bellum

The prohibition of the threat or use of force between States is set out in article 2(4) of the UN Charter and is also binding on States under customary international law. The recognised exceptions to the prohibition are a use of force in →Self-defence when an armed attack occurs (under article 51 of the UN Charter and customary international law), and a use of force authorised by the UN Security Council acting under Chapter VII of the Charter. Customary international law rules and the UN Charter apply in outer space, including the Moon and other celestial bodies, as recognised in article III of the OST. Article 3(2) of the Moon Agreement expressly applies the prohibition of the threat or use of force on the moon and prohibits using the moon itself to commit a threat or use of force or to threaten a hostile act 'in relation to the earth, the moon, spacecraft or their personnel or manmade space objects'. The issue is therefore not the applicability, but the application of *jus ad bellum* rules in outer space.

1. Threat of force

The possession by a State of space weapons is not unlawful. In the Nuclear Weapons Advisory Opinion (para 48) (→Nuclear Weapons Advisory Opinion) the International Court of Justice held that mere possession of weapons is not necessarily an unlawful threat to use force (→Use of force, prohibition of threat), but depends on 'whether the particular use of force envisaged would be directed against the territorial integrity or political independence of a State, or against the Purposes of the United Nations or whether, in the event that it were intended as a means of defence, it would necessarily violate the principles of necessity and proportionality.' Given the level of space debris created by kinetic ASAT attacks, it is possible that even a threat to carry out such an attack in →Self-defence would be unlawful due to the entailed violation of the principle of proportionality.

Regarding placement or stationing of weapons in outer space, under article IV(1) of the OST, it is prohibited 'to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.' The OST does not prohibit the placement of other kinds of weapons in space and does not prohibit the testing or use of conventional weapons in outer space.

Regarding explicit threats to use force, the International Court of Justice has held that 'if the use of force itself in a given case is illegal – for whatever reason – the threat to use such force will likewise be illegal' (*Legality of the Threat or Use of Nuclear Weapons [Advisory Opinion]* para. 47). The definition of a prohibited 'use of force' in outer space is therefore relevant to both the prohibition of the threat and the use of force.

2. Use of force

There is no agreed definition of a prohibited use of force (→Use of force, prohibition of) in outer space. Issues include determining whether the use of force is against a State, if temporary and reversible harm such as jamming or dazzling of satellites suffices, and difficulties of attribution and ascertaining intent.

To fall within the scope of the prohibition of the use of force, the use of force must be in 'international relations' and 'against the territorial integrity or political independence of any state, or in any other manner inconsistent with the Purposes of the United Nations' (Article 2(4) UN Charter). When the object or target of a forcible act is a space object, it is unclear if the nexus requires legal ownership by the State or if registration to a launching State (required by the Registration Convention article 2) would suffice. The concept of the injured State under the international law of State responsibility should be applied to determine whether the required nexus is met (Hitoshi Nasu, 'Targeting a Satellite: Contrasting Considerations between the Jus Ad Bellum and the Jus in Bello' (2022) 99 *International Law Studies* 142, 164).

The *travaux préparatoires* of the UN Charter affirm that a prohibited 'use of force' in article 2(4) refers to armed force and not to economic or other forms of coercion. The prohibition of the use of force applies 'to any use of force regardless of the weapons employed' (*Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion* 1996 ICJ Rep 226, para. 39.) What counts is the physical effects of the application of force. This has implications for the creation of space debris by a State (for example, through testing or use of a kinetic ASAT weapon): in certain circumstances, the intentional creation of space debris which has the effect of damaging or destroying another State's satellite could constitute a 'use of force'.

It is legally uncertain whether temporary and reversible effects would suffice to fall within the definition of a prohibited 'use of force' (for a discussion, see Erin Pobjie, *Prohibited Force: The Meaning of Use of Force in International Law* (Cambridge University Press, 2024), 135–7). This is especially relevant to military uses of outer space, because many counter-space capabilities rely on such effects, such as electromagnetic attacks to impair function without destruction, including jamming satellite signals, or dazzling a satellite with a laser to temporarily 'blind' it. These acts may not permanently damage or destroy the satellite but may nevertheless cause substantial harm due to military and civilian dependence on some space systems. Harm may extend beyond the denial or destruction of a satellite to include the effects on civilians, for example, interfering with food production or disaster relief. It is not clear in how far such secondary effects are relevant to a determination of whether any gravity threshold for a prohibited use of force is met. In this regard, developing State practice with respect to cyber operations may prove useful by analogy.

There appears to be consensus among States that deliberately causing harm is an element of a 'use of force' in outer space. Attempts to define this term for the purposes of outer space – including the 2008 draft treaty sponsored by Russia and China on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects ('PPWT'); the 2014 Draft PPWT and the 2019 Report of the UN Group of Governmental Experts on Further Practical Measures for the Prevention of an Arms Race in Outer Space (UN Doc. A/74/77 (19 April 2019), para. 32) – all refer to hostile or intentional acts. It is likely that States will consider intent as an element of a 'use of force' in outer space, whereas accidental, mistaken or recklessly caused damage will be perceived as irresponsible or unsafe behaviours. The difficulty is that a deliberate or hostile intent is difficult to discern in outer space. In outer space, certain acts may give rise to a threat perception but the affected State may not be able to verify or exclude a hostile intent, for example, with respect to Rendezvous and Proximity Operations.

3. Self-defence

States have a right to exercise →Self-defence under article 51 of the UN Charter and customary international law in response to an armed attack. This right extends to armed attacks that occur in outer space. The 2008 draft PPWT (art. V) and 2014 draft PPWT (art. IV) sponsored by Russia and China (referred to in para. 30 above) recognise the right to self-defence under article 51 of the UN Charter, although only the 2014 draft PPWT expressly refers to both individual and collective self-defence. NATO has stated that 'attacks to, from, or within space' could lead to the invocation of article 5 of the Washington Treaty, which provides for the exercise of individual or collective self-defence by NATO member States (Brussels Summit Communiqué Issued by NATO Heads of State and Government (2021) (14 June 2021), para. 33). However, some authors have argued that the 'peaceful purposes' requirement in article IV(2) OST (see para. 15 above) should be interpreted to prohibit all forms of military force in outer space, including self-defence (e.g. Marko G Markoff, 'Disarmament and "Peaceful Purposes" provisions in the 1967 Outer Space Treaty', (1976) 4(1) *Journal of Space Law* 3).

States may exercise their right of self-defence by using force in outer space subject to the customary international law requirements of necessity and proportionality, even if the armed attack took place on Earth, or vice versa. The use of force in self-defence does not need to take the same form as the armed attack it is defending against. Any measures in self-defence must be reported by the victim State to the UN Security Council under article 51 of the UN Charter.

Issues that arise in relation to the right to self-defence in outer space include attribution and proportionality. As discussed above, it is legally uncertain whether article VI of the OST displaces the customary international rule of attribution under the international law of State responsibility, especially with regard to uses of force. The exercise by a State of its right to self-defence must respect the customary international law requirements of necessity and proportionality. Proportionality is particularly relevant with respect to the creation of space debris: carrying out a kinetic ASAT attack in self-defence may be unlawful because the widespread creation of destructive space debris would likely violate the principle of proportionality.

D. International humanitarian law

1. Applicability

International humanitarian law ('IHL') (→humanitarian law, international) applies in situations of armed conflict. As Article III OST makes clear, States must conduct their activities in outer space in accordance with international law. The applicability of IHL to hostilities in outer space is affirmed by common article 1 of the Geneva Conventions, in which '[t]he High Contracting Parties undertake to respect and to ensure respect for the present Convention in all circumstances'. The International Court of Justice has stated that IHL applies 'to all forms of warfare and to all kinds of weapons, those of the past, those of the present and those of the future' (International Court of Justice, *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion, 8 July 1996, para. 86). Common article 2 of the 1949 Geneva Conventions and article 1(3) of Additional Protocol I ('API') provide that those treaties apply 'to all cases of declared war or any other armed conflict which may arise between two or more of the High Contracting Parties'. In addition to specific treaties regulating the conduct of hostilities, 'near universal' agreement exists that customary IHL principles apply in outer space (Schmitt, 116).

For IHL to apply to particular hostilities in outer space in the absence of a pre-existing armed conflict, certain thresholds must be met. For international armed conflicts ('IACs'), hostilities must take place between the armed forces of two or more States. For non-international armed conflicts ('NIACs'), the intensity threshold for an armed conflict must be reached. It is not clear whether non-destructive attacks against space objects (for example, targeting military satellites using non-kinetic means that have temporary and reversible effects) would amount to 'hostilities' for IACs or reach the required threshold of intensity for NIACs.

2. 'Attack'

A similar question relates to when the threshold of an 'attack' is reached under IHL. This is relevant because many rules in IHL apply to 'attacks', such as the rules of distinction, proportionality and precautions. 'Attacks' are defined as 'acts of violence against the adversary, whether in offence or in defence' (API art 49(1)). It is unclear under which circumstances non-kinetic operations against space objects would be considered an 'attack' under IHL. The ICRC's position is that these IHL rules apply 'not only to kinetic operations against space objects, but also to non-kinetic operations that would disable space objects without necessarily damaging them physically' (*The Potential Human Cost of the Use of Weapons in Outer Space and the Protection Afforded by International Humanitarian Law,* (9 April 2021), 3). Bill Boothby argues that 'jamming operations that do not cause injury or physical damage are unlikely to be classified as an attack' ('Space Weapons and the Law' (2017) 93 *International Law Studies* 179, 210, footnote omitted). This legal issue is also highly debated with respect to analogous cyber operations (→cyber warfare).

3. Means and methods of warfare

(i) Space weapons

While the OST prohibits placement of nuclear weapons in outer space, it does not prohibit the placement or use of conventional weapons. It is debated what constitutes a space 'weapon' due to the unique characteristics of outer space discussed in section A (see Boothby). Attempts to define a space 'weapon' include the 2008 draft PPWT (art. I(c)) and the 2014 draft PPWT (art. 1(b)). The definition of space 'weapon' is relevant to several IHL customary and treaty rules relating to weapons, for example, the prohibition to use weapons of a nature to cause superfluous injury or unnecessary suffering (ICRC, *Study on Customary International Humanitarian Law* ('ICRC customary study'), rule 70; API art. 35(2)) or weapons that are by nature indiscriminate (ICRC customary study, rule 71; API art. 51(4)) and the obligation to review new weapons to ensure compliance with IHL (API art. 36).

(ii) Principle of distinction

Under the principle of distinction, '[t]he parties to the conflict must at all times distinguish between civilian objects and military objectives. Attacks may only be directed against military objectives. Attacks must not be directed against civilian objects' (ICRC customary study, rule 7; API arts 48 and 52(2)). This is a 'cardinal principle' of IHL and an 'intransgressible principle of international customary law' (*Nuclear Weapons Advisory Opinion*, paras 78-9). A challenge in the space environment is the dual use nature of many space objects, such as hosted military payloads on civil or commercial satellites, or the reliance of civil and commercial infrastructure on military satellites (e.g. GPS and equivalents). In each case, the question is whether the object by its 'nature, location, purpose or use make[s] an effective contribution to military action' and if its 'partial or total destruction, capture or neutralization, in the circumstances ruling at the time, offers a definite military advantage' (ICRC customary study, rule 8; API art 52(2)). If so then it is a →military objective; if not then the object is a civilian object (ICRC customary study, rule 9; API art 52(1)).

In the space environment there is a further problem of identifying the nature, purpose or use of an object. Registering a military satellite as civilian and then using it to facilitate an attack to kill or injure (and in some versions, capture) an adversary will violate the prohibition of perfidy (ICRC customary study, rule 36; API art 37(1)). In case of doubt, the presumption shall be in favour of it being a civilian object (API art. 52(3)). In situations where only part of the object meets the definition of a military objective, there is controversy over whether the entire object qualifies as a military objective and may therefore be targeted (see International Law Association Study Group on the Conduct of Hostilities in the 21st Century, *The Conduct of Hostilities and International Humanitarian Law - Challenges of 21st Century Warfare, Final Report* (25 June 2017), 333 ff). This also relates to the assessment of →Proportionality and collateral damage (see ICRC, *International Expert Meeting Report: The Principle of Proportionality* (2018), section 4.4.1.1.)

(iii) Astronauts

Also related to the principle of distinction is the status of military astronauts and civilians working in military space commands or for commercial space entities providing services to the military. The status of military astronauts under IHL is relevant to the rules applicable to their treatment during an international armed conflict, i.e. whether they may be captured and detained, or if they must be rescued and returned. There is tension between the rules of IHL defining combatants and the status of astronauts under space law as envoys of humankind in the OST and Rescue Agreement (see Cassandra Steer and Dale Stephens, 'International Humanitarian Law and Its Application in Outer Space', in *War and Peace in Outer Space* (Cassandra Steer and Matthew Hersch (eds.) (Oxford University Press, 2021), 23).

(iv) Indiscriminate attacks

The prohibition of indiscriminate attacks under IHL (ICRC customary study, rule 11; API art 51(4)) greatly restricts the lawfulness of kinetic ASAT attacks due to the creation of destructive space debris. This is because the effects of such an attack cannot be limited as required by IHL 'and consequently … are of a nature to strike military objectives and civilians or civilian objects without distinction' (ICRC customary study, rule 12; see also API art 51(4)). Attacks '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' violate the principle of proportionality (ICRC customary study, rule 14) and are considered indiscriminate (ICRC customary study, rule 12; API art 51(5)(b)).

(v) Precautions

The parties to an armed conflict are required to 'take all feasible precautions in the choice of means and methods of warfare with a view to avoiding, and in any event to minimizing, incidental loss of civilian life, injury to civilians and damage to civilian objects' (ICRC customary study, rule 17; API art. 57(2)(a)(ii)) and 'to protect the civilian population and civilian objects under their control against the effects of attacks' (ICRC customary study, rule 22; API art 58(c)). Parties to an armed conflict must therefore avoid a kinetic ASAT attack when an alternative, less harmful means of attack is possible, such as non-kinetic ASAT.

(vi) Environmental protections under international humanitarian law

Kinetic ASAT attacks may also be restricted by specific protections of and obligations in relation to the environment under IHL, including under articles 35(3) and 55 API and customary international law. Kinetic ASAT attacks that create destructive space debris could violate the prohibition 'to employ methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment' under article 35(3) API. States parties to the ENMOD Convention are prohibited from engaging 'in military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party' (art I(1)). 'Environmental modification techniques' include 'any technique for changing - through the deliberate manipulation of natural processes - the dynamics, composition or structure' of outer space (art. II). F. Tronchetti argues that the ENMOD Convention 'may create restrictions on the use of' ASAT weapons (344-5).

Assessment

Current developments in the use of outer space have significant implications for militaries, commercial actors and civilians. Advances in military counterspace capabilities and the increasingly embedded dual military and civilian uses of space infrastructure are taking place in a rapidly changing orbital context due to the growth in number of commercial space actors and the placement in orbit of satellite mega-constellations. Increased congestion in low Earth orbit and intensifying competition between actors for access to and control of outer space greatly escalates the risks of and from space debris from accidental collisions and deliberate targeting of satellites. Scientific research on the Kessler Syndrome makes clear the danger of space debris rendering outer space inaccessible to humans for long periods. Due to heavy reliance of civilians on satellites, the International Committee of the Red Cross has underscored the 'potentially significant human cost for civilians on earth of the use of weapons in outer space' (ICRC, *The Potential Human Cost of the Use of Weapons in Outer Space and the Protection Afforded by International Humanitarian Law,* (9 April 2021), 4).

In light of the potentially catastrophic risks of military uses of outer space, international efforts to prevent an arms race in outer space ('PAROS') are underway at the United Nations. In 2022, the UN General Assembly established an Open-Ended Working Group ('OEWG') on reducing space threats through norms, rules and principles of responsible behaviours: '(a) To take stock of the existing international legal and other normative frameworks concerning threats arising from State behaviours with respect to outer space; (b) To consider current and future threats by States to space systems, and actions, activities and omissions that could be considered irresponsible; [and] (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' (para 5). The OEWG held four working sessions in 2022 and 2023 but ultimately failed to reach consensus on even a procedural report on the meetings and produced no formal report or set of recommendations. In 2023, the UN General Assembly established a Group of Governmental Experts on Further Practical Measures for PAROS 'to consider and make recommendations on substantial elements of an international legally binding instrument on the prevention of an arms race in outer space, including, inter alia, on the prevention of the placement of weapons in outer space' (UN General Assembly, *Resolution 77/250* (9 January 2023), UN Doc. A/RES/77/250).

So far UN negotiations on PAROS have not reached consensus on binding rules to govern military activities in outer space. This stalemate reflects deep divisions in the international community between the desirability and effectiveness of pursuing a hard-law approach (such as Russia and China's draft treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects), or a soft-law approach focusing on enhancing 'safety, security and sustainability of all outer space activities' and establishing transparency and confidence building measures (such as the EU Draft International Code of Conduct for Outer Space Activities (31 March 2014). Key substantive issues at stake include effective verifiability, legal gaps in definitions and framing of rules which could be exploited by adversaries, and the desire for flexibility. In October 2023, the UN First Committee (Disarmament and International Security) voted to put forward two draft resolutions to the General Assembly that would create parallel Open-Ended Working Groups related to PAROS with different goals: a UK-sponsored draft resolution titled 'Reducing space threats through norms, rules and principles of responsible behaviours' (UN Doc. A/C.1/78/L.15/Rev.1), and another, backed by Russia, titled 'Further practical measures for the prevention of an arms race in outer space' (UN Doc. A/C.1/78/L.55), which would make recommendations on an international legally binding instrument. Delegates have warned that 'parallel processes would lead to further polarization and fragmentation of efforts to preserve space security' (https://press.un.org/en/2023/gadis3730.doc.htm).

Negotiations to develop new binding rules or soft-law norms for outer space security must recognise that military uses of outer space 'do not occur in a legal vacuum but are constrained by existing law, notably the Outer Space Treaty, the UN Charter and IHL' (ICRC (2021), 4). Either approach risks undermining existing international law rules that apply to military uses of outer space. The international law rules on the prohibition of the use of force (*jus ad bellum*) and international humanitarian law already apply in outer space and can provide useful guidance and important limitations on military uses of this domain. Establishing clarity and consensus on how to apply *jus ad bellum* and IHL rules in the unique environment of outer space is a useful foundation for establishing agreement on norms, rules and principles and eventually a binding treaty to prevent an arms race in outer space.

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