

Space Arms Control: Lex Lata and Currently Active Proposals

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Abstract

The inadequacy of existing international law in the prevention of an arms race in outer space leaves uncertainties to international peace and security. The resurgence of aggressive space programmes in the new millennium has intensified concerns over the possible degradation of outer space into an area of conflicts, prompting various initiatives aimed to fill this loophole. The year 2014 witnessed the release of the revised draft PPWT proposed by China and Russia at the CD, the fifth public edition of the ICoC promoted by the EU, and the adoption of the Resolution on “No first placement of weapons in outer space” in the General Assembly. This paper attempts to make a comparison between the three initiatives in terms of their postulated primary-level obligations, namely to what extent space weapons are prohibited on the chain of “research, development, testing, placement and use”, and the verification of compliance with these obligations.

With folklore and legends of the universe being told since time immemorial, humankind's exploration and use of outer space did not materialize until 1957, when the former Soviet Union successfully launched *Sputnik I*, the first artificial satellite. In the ensuing decades, the use of outer space brought about unprecedented transformations to human life, in particular in the last two decades as the development in the space sector accelerated. On the one hand, the number of space actors increased and diversified significantly. Whereas the early stage of the Space Era was almost exclusively dominated by the former Soviet Union and the United States, today at least eleven states and one international intergovernmental organization have acquired independent launch capability,¹ and over sixty countries or government consortia own or

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1. Russia, the US, France, Japan, China, the UK, the European Space Agency (ESA), India, Israel, Ukraine, Iran, and the Democratic People's Republic of Korea.

operate active satellites.² States have been joined by private entities, in particular those from traditional market-economy states, in the exploration and use of outer space. On the other hand, the leap of science technologies is opening a new vista for further space exploration and use, such as asteroid mining and Space-Based Solar Power (SBSP).

States share common stakes in utilizing the immense instrumental values of outer space. Unfortunately we Earth dwellers are far from a perfectly harmonious species. Our “internal friction” has inevitably spilled over beyond the Earth to outer space, with satellites put into orbit to enhance the performance of military assets on the Earth. Although outer space remains one of the very few spatial environments in which weapons have not been deployed, the research, development, and testing of aggressive space weapons can be traced back to the 1950s, when the competition between the former Soviet Union and the US was at its height. The importance attached to such weapons waned substantially after the détente of the Cold War, as the competition between the two superpowers in space gave way to co-operation, and breakthroughs in arms control were made after the Cuban Missile Crisis.³ The change of geopolitics after the Cold War helped to foster a more favourable atmosphere for co-operation in space. Whereas the Cold War restricted co-operation between the members of the two blocs, the post-Cold War era has witnessed the development of new axes and mechanisms of co-operation.⁴ However, the first ten years of the new millennium witnessed the revival of the possibility of deploying weapons in outer space,⁵ and the tests of terrestrial-based anti-satellite weapons (ASATs).

The destabilizing effect of space weapons and their potential devastating threat to the benign space environment make them one of the most serious challenges to the peaceful exploration and use of outer space. As existing international law only prohibits certain categories of space weapons, urgent actions need to be taken to fill the lacuna. However, states disagree markedly, at the primary level, as to whether space-based weapons or terrestrial-based ASATs need to be addressed more imminently.⁶ Scholarly debates have addressed the question of at which points on the chain of “research, development,

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2. US Department of Defence and US Office of the Director of National Intelligence, “National Security Space Strategy: Unclassified Summary” (January 2011), online: <http://www.defense.gov/home/features/2011/0111_nsss/docs/NationalSecuritySpaceStrategyUnclassifiedSummary_Jan2011.pdf>.
 3. See generally, Roald SAGDEEV and Susan EISENHOWER, “United States-Soviet Space Cooperation during the Cold War”, online: NASA <http://www.nasa.gov/50th/50th_magazine/coldWarCoOp.html>.
 4. Nicolas PETER, “The Changing Geopolitics of Space Activities” (2008) 22 *Space Policy* 100 at 105.
 5. Tim WEINER, “Air Force Seeks Bush’s Approval for Space Weapons Programs” *New York Times* (18 May 2005), online: *New York Times* <http://www.nytimes.com/2005/05/18/business/air-force-seeks-bushs-approval-for-space-weapons-programs.html?_r=0>.
 6. China, for instance, holds that “the risk of weaponization of and an arms race in outer space has been increasing, which will impede peaceful uses of outer space, undermine trust among states in space security, affect global strategic balance and stability as well as nuclear disarmament process”. See e.g. WU Haitao, “Statement at the Conference on Disarmament” (10 June 2014), online: People’s Republic of China <http://www.fmprc.gov.cn/mfa_eng/wjz_663304/zwjg_665342/zwbd_665378/t1164553.shtml>. The US, on the other hand, holds that “terrestrially-based anti-satellite systems posing the greatest and most imminent threat to space systems are not captured” at the 2014 Session of the Conference on Disarmament. See e.g. Frank A. ROSE, “Continuing Progress on Ensuring the Long-Term Sustainability and Security of the Space Environment, Remarks at Conference on Disarmament Plenary” (10 June 2014), online: US Department of State <<http://www.state.gov/t/avc/rls/2014/227370.htm>>.

testing, placement and use” they should be prohibited.⁷ At the secondary level, the verification of compliance with primary-level obligations is immensely difficult in outer space.⁸ Highly intrusive verification measures, such as on-site inspections, do not seem to be a realistic option given the utmost confidentiality and sensitivity of space activities.⁹ Space arms control obligations at the primary and secondary levels are intertwined as the verifiability varies with respect to different aspects of prohibition, and verifiability would in turn affect states’ acceptance of primary-level obligations.

This paper begins with a discussion on the legality of space-based weapons and terrestrial-based ASATs in existing international law. Section II offers an appraisal of current initiatives in space arms control, with a focus on their effectiveness in addressing space-to-Earth weapons, terrestrial-based ASATs, and space-based ASATs. Section III examines the issue of verification in space arms control, and attempts to propose an optimal combination between primary-level obligations and verifiability in a future space arms control treaty. Section IV proffers some suggestions to strengthen space arms control.

I. LEX LATA

A. *An Article-by-Article Consideration of the Outer Space Treaty*

This section will consider the relevant Articles of the Outer Space Treaty, in order of their importance for arms control in space.

I. *Article IV*

Article IV of the Outer Space Treaty addresses the issue of weapons in outer space directly. Pursuant to its paragraph 1, the placement, installation, and stationing of weapons of mass destruction (WMDs) are completely banned in outer space, including celestial bodies and outer void space (the immense void space in between celestial bodies).¹⁰ WMDs traditionally include nuclear, chemical, and biological weapons (NCBs).¹¹ The fact that the use of nuclear weapons in outer space could bring about indiscriminate damage therein was known long before the negotiation of the Outer Space Treaty. After the former Soviet Union’s successful launch of *Sputnik I*, its launch capacity, which could be used as Intercontinental Ballistic Missiles (ICBMs) and tipped

7. See e.g. Kenneth S. BLAZEJEWSKI, “Space Weaponization and US-China Relations” (2008) 2 Strategic Studies Quarterly 33; Jinyuan SU, “Towards an Effective and Adequately Verifiable PPWT” (2010) 26 Space Policy 152.

8. See e.g. Ben BASELEY-WALKER and Brian WEEDEN, “Verification in Space: Theories, Realities and Possibilities” (2010) Disarmament Forum 39.

9. Paula A. DESUTTER, “Is an Outer Space Arms Control Treaty Verifiable?” (4 March 2008), online: US Department of State <<http://2001-2009.state.gov/t/vci/rls/rm/101711.htm>>.

10. *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 U.N.T.S. 205, 6 I.L.M. 386 (entered into force 10 October 1967), art. IV [*Outer Space Treaty*]. For a distinction between celestial bodies and outer void space, see Bin CHENG, “Properly Speaking, Only Celestial Bodies Have Been Reserved for Use Exclusively for Peaceful (Non-Military) Purposes, but Not Outer Void Space” in Michael N. SCHMITT, ed., *International Law across the Spectrum of Conflict: Essays in Honour of Professor L.C. Green on the Occasion of his Eightieth Birthday* (Naval War College Press, 2000), 81 at 83–4.

11. For a discussion on the definition of weapons of mass destruction, see W. Seth CARUS, *Defining “Weapons of Mass Destruction”*, Center for the Study of Weapons of Mass Destruction, National Defence University, Occasional Paper No. 8, January 2012.

with nuclear warheads, was perceived as a serious threat to the US. With the aim of acquiring Anti-Ballistic Missile (ABM) capacity, the US conducted a series of high-altitude nuclear tests in 1958, arriving at the conclusion that although the blasts could destroy incoming missiles, electromagnetic pulse (EMP) radiation would severely affect communications and have serious implications for both manned spaceflight and for satellites carrying electronics.¹² In 1962, the EMP radiation generated in the exo-atmospheric nuclear testing programme conducted by the US disabled at least six satellites, some belonging to the US and others to Britain and the former Soviet Union.¹³ The former Soviet Union's high-altitude nuclear tests in response to US tests provided the same results. In 1963, the Partial Test Ban Treaty (PTBT), which bans nuclear weapon tests in the atmosphere, in outer space, and under water, was signed as a first step towards a complete ban on nuclear testing.¹⁴ After signing the PTBT, both the US and the USSR announced that they had no intention of stationing any objects carrying nuclear weapons or other WMDs in outer space.¹⁵ The Outer Space Treaty thus achieved the prohibition of the placement of WMDs in outer space without great difficulties. Article IV of the Outer Space Treaty is complementary to Article I of the PTBT, as the latter does not prohibit the placement of nuclear weapons in outer space, although it does prohibit their testing.

Article IV, paragraph 2 of the Outer Space Treaty imposes more stringent constraints on the military use of celestial bodies, namely that the establishment of military bases, installations, and fortifications, the testing of any type of weapons, and the conducting of military manoeuvres on celestial bodies shall be forbidden.¹⁶ The provision was a result of the Soviet-US gaming on the Moon race. By that time, although the former Soviet Union still seemed to be ahead of the US in space, the gap was marginal due to the rapid progress of the US manned space programme. The prevention of the militarization of the Moon and the monopoly of resources thereon was a mutually acceptable outcome, as neither the US nor the former Soviet Union was confident that they would win the race.¹⁷

Article IV is not free from ambiguities, partly due to the lack of clear terminological definitions, and partly due to subsequent technical developments. For instance, disputes arise as to what amounts to "placement",¹⁸ and whether nuclear devices used to deflect

12. James Clay MOLTZ, *The Politics of Space Security: Strategic Restraint and the Pursuit of National Interests*, 2nd ed. (Stanford University Press, 2008) at 96–7.

13. *Ibid.*, at 118–21.

14. *Treaty Banning Nuclear Weapon Tests in the Atmosphere, Outer Space and Under Water*, 5 August 1963, 480 U.N.T.S. 43 (entered into force 10 October 1963), art. I [*Partial Test Ban Treaty*].

15. US Department of State, "Narrative of Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies", online: US Department of State <<http://www.state.gov/t/isn/5181.htm>>.

16. *Outer Space Treaty*, *supra* note 10, art. IV, para. 2.

17. Moltz, *supra* note 12 at 149.

18. See e.g. Kai-Uwe SCHROGL and Julia NEUMANN, "Article IV" in Stephan HOBE, Bernhard SCHMIDT-TEDD, and Kai-Uwe SCHROGL, eds., *Cologne Commentary on Space Law*, Vol. 1 (Cologne: Carl Heymanns Verlag, 2009), 70 at 79, who hold that a full rotation in orbit is not required in order to amount to "placement in orbit"; and B. Sandeepa BHAT and V. Kiran MOHAN, "Anti-Satellite Missile Testing: A Challenge to Article IV of the Outer Space Treaty" (2009) 2 National University of Juridical Sciences Law Review 205 at 209, who believe that the provision does not ban nuclear armed "pop-up" ASAT interceptors that ascend directly to their targets without entering into orbit.

Near Earth Objects (NEOs) threatening the Earth should be regarded as “weapons”.¹⁹ There have also been debates on whether celestial bodies, which are reserved “exclusively for peaceful purposes”, are completely non-militarized.²⁰ Nonetheless, the largest loophole of this Article is the failure to ban conventional weapons in outer void space. Whereas some scholars hold that the loophole was left open because the technical feasibility of such placement was not foreseen,²¹ others are of the view that this omission was made deliberately by the US in line with the notion of “freedom of space”.²² But it seems that placing conventional weapons in Earth orbits was foreseeable when the treaty was negotiated. Early in 1960 the US Department of Defence approved the Air Force’s Satellite Inspector programme in which the interceptor would be launched into space and manoeuvre into a nearby location to destroy a Soviet target satellite.²³

2. Article IX

Terrestrial-based ASATs are not explicitly addressed in the Outer Space Treaty, but only incidentally by its Article IX, which obliges States Parties to “conduct all their activities in outer space ... with due regard to the corresponding interests of all other States Parties to the Treaty”.²⁴ As an elaboration of the “due regard” principle, Article IX further prescribes three positive obligations. First, States Parties shall “pursue studies of outer space ... and conduct exploration of them so as to avoid their harmful contamination ... and, where necessary, shall adopt appropriate measures for this purpose”. Second, a State Party shall undertake appropriate international consultations before proceeding with an activity or experiment planned by it or its nationals in outer space, if it has reason to believe that it would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space. Third, a State Party may request consultation if it has reason to believe that an activity or experiment planned by another State Party in outer space would cause potentially harmful interference with activities in the peaceful exploration and use of outer space.²⁵ It appears that the above principles do not limit states’ right to conduct ASAT tests per se, but only impose certain obligations on their external effects and on procedural formalities at best. The question follows whether the conducting

19. See e.g. Joseph PACKER, Jeffrey A. KURR, and Adam ABELKOP, “The Policy Trajectory of United States Asteroid Deflection Planning” (2013) 1 *Timely Interventions: An Transnational Journal of Public Policy Debate* 2 at 5–6. “Nuclear weapons” are defined by the International Court of Justice as “explosive devices whose energy results from the fusion or fission of the atom”, see *Legality of the Threat or Use of Nuclear Weapons case*, Advisory Opinion, [1996] I.C.J. Rep. 226, at 243 [*Nuclear Weapons Advisory Opinion case*].

20. See e.g. Jinyuan SU, “Use of Outer Space for Peaceful Purposes: Non-militarization, Non-aggression and Prevention of Weaponization” (2010) 36 *Journal of Space Law* 253 at 256, arguing that the negative undertakings in art. IV, para. 2 of the Outer Space Treaty is narrower than those in art. I, para. 1 of the Antarctic Treaty.

21. See e.g. Karl D. HEBERT, “Regulation of Space Weapons: Ensuring Stability and Continued Use of Outer Space” (2014) 12 *Astropolitics: The International Journal of Space Politics & Policy* 1 at 4.

22. See e.g. Dale ARMSTRONG, “American National Security and the Death of Space Sanctuary” (2014) 12 *Astropolitics: The International Journal of Space Politics & Policy* 69 at 71.

23. Moltz, *supra* note 12 at 100.

24. *Outer Space Treaty*, *supra* note 10, art. IX.

25. *Ibid.*

state breaches the overarching obligation of due regard or any of the three pillar elaborating obligations, for creating large amounts of space debris or failing to seek consultations with other space-faring countries in ASAT tests.²⁶

The requirement of due regard is a reiteration of the rule of general international law, in the context of outer space, that the legitimate interests of other states must be taken into consideration when a state exercises its right.²⁷ As one of the constraints upon the freedom of exploration and use of outer space, it applies to military activities therein. However, the term is highly ambiguous. Referring to the preparatory work of the treaty, it could be safely asserted that the term was never intended to outlaw ASAT tests categorically, or require prior consent from other states. Note that this norm was inherited from General Assembly Resolution 1962 (XVIII), during the drafting of which it was proposed by the UK, in response to a Soviet Union draft that required prior consent from potentially affected countries.²⁸ Although the creation of a large amount of space debris in ASAT tests, in particular those in the most-used Low-Earth Orbits (LEOs) and Geostationary Orbit (GEO), may be contrary to the “corresponding interests” of other States Parties, the “due regard” requirement seems to place more emphasis on the “subjective” element on the part of the conducting state.

Customary international humanitarian law may shed some light on what subjective efforts are required by the “due regard” principle. As recognized by the International Committee of the Red Cross (ICRC), the rule that methods and means of warfare must be employed with “due regard” to the protection and preservation of the natural environment has become a norm of customary international law applicable in international, and arguably also in non-international, armed conflicts.²⁹ It is further elaborated that:

[I]n the conduct of military operations, all feasible precautions must be taken to avoid, and in any event to minimize, incidental damage to the environment. Lack of scientific certainty as to the effects on the environment of certain military operations does not absolve a party to the conflict from taking such precautions.³⁰

It appears logical to argue that states should at least exercise equivalent diligence, if not more, in peacetime military activities as in armed conflicts. Therefore, the primary element of due regard is precaution, which is not measured by any quantitative threshold of environmental impact, but rather by whether efforts such as risk assessment and cost-effective precautionary measures are made. The assessment must be done on a case-by-case basis, taking into account the specific situations and the capacities of the conducting state.

26. See e.g. 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 *Journal of Space Law* 321.

27. Ram JAKHU, “Legal Issues Relating to the Global Public Interest in Outer Space” (2006) 32 *Journal of Space Law* 31 at 47.

28. U.S.S.R. *Draft Declaration of the Basic Principles Governing the Activities of States in the Exploration and Use of Outer Space*, UN Doc. A/5482 (1963), Annex III, para. 6.

29. Jean-Marie HENCKAERTS and Louise DOSWALD-BECK, *Customary International Humanitarian Law*, Vol. 1 (Cambridge: Cambridge University Press, 2005) at 147.

30. *Ibid.*

With regard to the three pillar obligations, although space debris has arguably become a new form of “harmful contamination” of outer space,³¹ States Parties are only obliged to “avoid” it, and adopt “appropriate” measures “where necessary”. It is observed that the ambiguous and subjective nature of establishing a standard for avoiding harmful contamination makes it difficult to assess whether an ASAT test violates the provision.³² The obligation to undertake appropriate international consultations is also subject to the highly subjective determination as to whether a state’s activity or experiment would cause potentially harmful interference with the activities of other States Parties in outer space. Even if such a need exists, there is no guidance as to the procedures and substances of consultations.³³ Ultimately, consultations in international law need not always lead to mutually acceptable solutions, and even if they do, there is no legal obligation to follow them.³⁴

In practice, states are reluctant to invoke Article IX when ASATs are tested, even when large amounts of space debris are created. This happened during the Cold War as well as in the new millennium.³⁵ Presumably, such an accusation is very likely to jeopardize the bilateral ties between an alleging state and the testing state. In addition, due to the principle of estoppel, space-faring countries do not want to find themselves bound by such an interpretation of Article IX when the need to pursue similar tests arises for them; for those countries which have done so in the Cold War, such an accusation would equate to their submission to the illegality of their past tests. Regardless of the underlying motives, this inaction constitutes “subsequent practice” in the application of Article IX, which may accumulate to the establishment of an interpretation of the Article as not limiting ASAT tests.³⁶

3. Article I

According to Article I of the Outer Space Treaty, the exploration and use of outer space shall be carried out “for the benefit and in the interests of all countries”.³⁷ As the word “shall” is usually used to impose an imperative obligation, the Article naturally entails legally binding obligations.³⁸ This is confirmed by the preparatory work of the Outer

31. Sergio MARCHISIO, “Article IX” in Hobe *et al.*, *supra* note 18, 169 at 177.

32. Mineiro, *supra* note 26 at 347–8.

33. *Ibid.*, at 338–9.

34. Lotta VIIKARI, *The Environmental Element in Space Law: Assessing the Present and the Charting the Future* (Leiden/Boston: Martinus Nijhoff, 2008) at 61.

35. In response to China bringing down its FY-1C in 2007, it seems that only Japan charged China with violating art. IX of the Outer Space Treaty, claiming that it requires signatory states to refrain from littering outer space with debris. See Carin ZISSIS, “China’s Anti-Satellite Test”, online: Council on Foreign Relations <<http://www.cfr.org/china/chinas-anti-satellite-test/p12684>>.

36. *Vienna Convention on the Law of Treaties*, 23 May 1969, 1155 U.N.T.S. 331, 8 I.L.M. 679 (entered into force 27 January 1980), art. 31.

37. *Outer Space Treaty*, *supra* note 10, art. I.

38. Cf. e.g. Promit CHATTERJEE, “Legality of Anti-Satellites Under the Space Law Regime” (2014) 12 *Astropolitics: The International Journal of Space Politics & Policy* 27 at 28–9, who argues that this Article does not create any binding legal obligation, but merely emphasizes the principal theme of the treaty that space exploration should be carried out in accordance with international law for the benefit and interest of all countries.

Space Treaty, during which Brazil proposed to include this principle in the operative part rather than only in the Preamble, and the proposal was accepted by all Member States of the UN Committee on the Peaceful Uses of Outer Space (COPUOS). The most important implication of this provision is that “it initiated the principle of global public interest in outer space, thereby establishing that the interests, both present and future, of all States must be taken into consideration in the exploration and use of outer space”.³⁹ However, the principle does not automatically outlaw space weapons. Whereas military activities are inherently violent, and thus contrary to the common benefit and interests, we must concede that, in an imperfect world, force used in the right and appropriate way is still indispensable for the benefit of the international community as a whole.

B. Article III of Outer Space Treaty as a “Gateway” for General International Law

Article III of the Outer Space Treaty provides that activities in the exploration and use of outer space shall be carried out “in accordance with international law, including the Charter of the United Nations”.⁴⁰ Although each field of international relations would be regulated most directly by its *lex specialis*, at the same time a significant part of international law, in particular long-established rules of customary international law and basic and explicit tenets of international law, are applicable generally.⁴¹ Article III thus serves as a “gateway” through which such rules become applicable to outer space.

The applicability of the UN Charter to space activities is highlighted in Article III. The prohibition of the threat or use of force is one of the fundamental principles for the UN and its Members to observe.⁴² The testing and deployment of space weapons for national security in peacetime, as a measure of self-protection, do not amount to use of force. The threat of force, as opined by Brownlie, consists of “an express or implied promise by a government of a resort to force conditional on non-acceptance of certain demands of that government”.⁴³ Without such an express or implied promise, the testing and deployment of space weapons shall not be taken as a threat of force either.

There are exceptions to the non-threat or use of force principle. First, the Charter recognizes “the inherent right of individual or collective self-defence if an armed attack occurs against a Member of the United Nations”.⁴⁴ Second, the Security Council may also “take such action *by air, sea, or land forces* as may be necessary to maintain or restore international peace and security”, if measures not involving the use of armed

39. Jakhu, *supra* note 27 at 37–9.

40. *Outer Space Treaty*, *supra* note 10, art. III.

41. Olivier BIBBELINK, “Article III” in Hobe *et al.*, *supra* note 18, 64 at 67.

42. *Charter of the United Nations*, 26 June 1945, 1 U.N.T.S. XVI (entered into force 24 October 1945), art. 2(4) [*UN Charter*].

43. Ian BROWNLIE, *International Law and the Use of Force by States* (Oxford: Oxford University Press, 1963) at 364.

44. *UN Charter*, *supra* note 42, art. 51.

force are inadequate.⁴⁵ Drafted before the Space Era began, the Charter did not foresee ASATs or weapons in space, although early missiles such as V-2 rockets were developed in World War II. Space weapons may nevertheless be legitimately used, subject to the principles of necessity and proportionality, in the exercise of self-defence by states and the use of forceful measures to maintain or restore international peace and security authorized by the Security Council. The Charter also 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”.⁴⁶ Imagine a scenario in which a large-size NEO is detected to have a significant chance of impact with the Earth, and the Security Council determines that it constitutes a threat to international peace and security and authorizes the placement of nuclear weapons in outer space to defend the Earth.⁴⁷ Although the placement is arguably banned by Article IV of the Outer Space Treaty, the authorization of the Security Council, which the Members of the UN have agreed to accept and carry out,⁴⁸ would excuse the wrongfulness arising from non-compliance with the Outer Space Treaty.

Article III of the Outer Space Treaty also obliges States Parties to carry on activities in the exploration and use of outer space “in the interest of maintaining international peace and security and promoting international cooperation and understanding”.⁴⁹ This wording was inherited from General Assembly Resolution 1962 (XVIII), and emphasizes two of the primary purposes of the United Nations.⁵⁰ It is argued that the deployment and use of space weapons of any kind would in all likelihood lead to an arms race in outer space, which would “threaten international peace and security as well as international cooperation”, and would thus be contrary to Article III.⁵¹ This broad interpretation may not be the intent of the drafters. But the development, testing, and deployment of space weapons are at least contrary to the underlying spirit, and the object and purpose, of the Outer Space Treaty, the conclusion of which was largely motivated by concerns over an arms race in outer space, and those of the UN Charter.

General international environmental law is also applicable to space activities via Article III. Among them the “no harm” principle, namely the responsibility of states to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states, or of areas beyond the limits of national jurisdiction, may impose constraints on space weapons by limiting their external environmental impacts. The principle, which originated from the transboundary context of international environmental law,⁵² has been expanded to protect global commons, namely areas

45. *Ibid.*, art. 42, emphasis added.

46. *Ibid.*, art. 103.

47. The placement of nuclear weapons in outer space is regarded as an important measure for the mitigation of NEOs that have very short warning time, such as long-period comets. See e.g. Packer *et al.*, *supra* note 19 at 5.

48. *UN Charter*, *supra* note 42, art. 25.

49. *Outer Space Treaty*, *supra* note 10, art. III.

50. *UN Charter*, *supra* note 42, art. 1, paras. 1, 3.

51. Jakhu, *supra* note 27 at 88.

52. In the *Trail Smelter* arbitration between the US and Canada, the Tribunal concluded that: “no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or person therein, when the case is of serious consequence and the

beyond national sovereign jurisdiction, from environmental pollution originating from these area or areas within national sovereign jurisdiction. This is recognized in both the 1972 Stockholm Declaration and the 1992 Rio Declaration.⁵³ Although the declarations are not legally binding, the principle has been recognized as a customary rule of international law.⁵⁴ It also appears in the preamble of some international environmental protection treaties, reflecting the objectives and purposes of the treaties,⁵⁵ and even in one of the operative paragraphs of the United Nations Convention on the Law of the Sea (UNCLOS), which entails contractual obligations.⁵⁶

In UNCLOS, an exception is made to free military vessels from environmental obligations.⁵⁷ Although at the conventional level states are reluctant to assume the same environmental obligations in their military activities as in their civil activities, the “no-harm” principle is nevertheless applicable to military activities as a customary rule. The question is the interpretation of the principle, which does not seem to prohibit any environmental pollution, as the term “damage” inherently carries a degree of severity. It is not clear what is the threshold over which a violation is constituted.

The customary character of the “no harm” principle is also recognized by the International Court of Justice (ICJ); in the *Nuclear Weapons* advisory opinion case and the *Gabčíkovo-Nagymaros Project* case, it stated that the “existence of the general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control is now part of the corpus of international law relating to the environment”.⁵⁸ By using “respect” rather than “not cause damage to”, the Court placed its emphasis on the “subjective” element, as does the “due regard” principle.

To summarize, existing international law does not explicitly prohibit conventional weapons in outer void space, nor terrestrial-based ASATs. There are other relevant rules of space law and general international law which may limit them indirectly, but overall these

injury is established by clear and convincing evidence”. See *Trail Smelter (USA v. Canada)*, Award of 11 March 1941, III RIAA 1938 at 1965.

53. *Declaration of the United Nations Conference on the Human Environment*, 16 June 1972, UN Doc. A/Conf.48/14/Rev.1 (1973), 11 I.L.M. 1416, Principle 21 [*Stockholm Declaration*]; *Rio Declaration on Environment and Development*, 13 June 1992, UN Doc. A/CONF.151/5/Rev.1 (1992), 31 I.L.M. 874, Principle 2 (emphasis added) [*Rio Declaration*].
54. Philippe SANDS, *Principles of International Environmental Law*, 2nd ed. (Cambridge: Cambridge University Press, 2003) at 54.
55. E.g. *Convention on Long Range Transboundary Air Pollution*, 13 November 1979, 18 I.L.M. 1442 (entered into force 16 March 1983), 5th preambular paragraph; *United Nations Framework Convention on Climate Change*, 9 May 1992, 1771 U.N.T.S. 107, 31 I.L.M. 849 (entered into force 21 March 1994), 8th preambular paragraph.
56. *United Nations Convention on the Law of the Sea*, 10 December 1982, 1833 U.N.T.S. 3, 21 I.L.M. 1261 (entered into force 16 November 1994), art. 194(2) [UNCLOS], which provides that: “States shall take all measures necessary to ensure that activities under their jurisdiction or control are so conducted as not to cause damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention”.
57. *Ibid.*, art. 236, which provides that “[t]he provisions regarding the protection and preservation of the marine environment do not apply to any warship, naval auxiliary, other vessels or aircraft owned or operated by a State and used only on government non-commercial service”.
58. *Nuclear Weapons Advisory Opinion case*, *supra* note 19, at 241, para. 29; *Gabčíkovo-Nagymaros Project (Hungry v. Slovakia)*, [1997] I.C.J. Rep. 7 at 41, para. 53 (emphasis added).

are broad and vague. With a lack of objective criteria for the assessment of violations, and their emphasis on subjectivity on the part of conducting states, much leeway is reserved for states in relation to the research, development, testing, and placement of such weapons.

II. CURRENTLY ACTIVE PROPOSALS

The rising concern over a possible arms race in outer space has prompted various proposals aimed at strengthening space arms control. Among them, the most active ones are: the Draft Treaty on the Prevention of Placement of Weapons in Outer Space and the Threat or Use of Force against Outer Space Objects (PPWT) proposed by China and Russia at the Conference on Disarmament (CD); the Draft International Code of Conduct for Outer Space Activities (ICoC) promoted by the EU; and the Russia-led initiative of unilateral commitment of no first placement of weapons in outer space.

A. *The PPWT*

The PPWT, one of the most active initiatives of space arms control today, was officially tabled at the CD by China and Russia on 12 February 2008.⁵⁹ The CD, which counts sixty-five Members currently, is the main multilateral disarmament negotiating forum of the international community. The preparation of the PPWT can be traced back to 2002, when seven states submitted to the CD a working paper outlining possible elements for a future space arms control treaty.⁶⁰ The release of the PPWT drew mixed comments: while a number of states expressed their support for the initiative, the US refuted it as flawed with unbalanced obligations and unverifiability.⁶¹ China and Russia responded to the concerns and questions raised by states in a working paper submitted to the CD on 18 August 2009.⁶²

On 10 June 2014, China and Russia transmitted to the CD the updated text of the PPWT (the 2014 PPWT).⁶³ The new draft aimed to bring the positions of states closer together, and to remove ambiguities identified in the initial version, by taking into account comments and proposals received from the interested states and reflecting the evolving situation in outer space. Major revisions of the new draft included the removal

59. *Draft Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force Against Outer Space Objects*, CD/1839 [2008 PPWT].

60. *Possible Elements for a Future International Legal Agreement on the Prevention of the Deployment of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects*, CD/1679. For comments and suggestions to the working paper, see *Compilation of Comments and Suggestions to the CD PAROS Working Paper (CD/1679)*, CD/1769; and *Compilation of Comments and Suggestions to the CD Working Paper on PAROS (CD/1679)*, CD/1818 (PAROS = Prevention of an Arms Race in Outer Space).

61. *Analysis of a Draft "Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force Against Outer Space Objects"*, CD/1847.

62. *Principal Questions and Comments on 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, and the Answers Thereto*, CD/1872.

63. *Draft Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects (PPWT)*, CD/1985 [2014 PPWT]. At the same conference, the US pledged that it would conduct an in-depth analysis of the 2014 PPWT, but also expressed the view that the preliminary assessment was that the new draft text did not address significant flaws in the 2008 PPWT. Among others, it mentioned that there is no effective verification regime to monitor compliance, and terrestrially based anti-satellite systems posing the greatest and most imminent threat are not captured. See Rose, *supra* note 6.

of the definition of outer space; the clarification of various definitions such as “outer space object”, “weapon in outer space”, “use of force”, and “threat of force”; the recognition of the rights of individual and collective self-defence; the recognition of the need for measures to verify compliance; and the elaboration of a dispute resolution mechanism. Despite the revisions, the US concluded that the new draft, “like the 2008 version, remains fundamentally flawed” and “provides no basis for the United States to support establishing an *ad hoc* committee to negotiate any such Treaty at the Conference on Disarmament or in any other forum”, in its analysis of the 2014 PPWT transmitted to the CD on 2 September 2014.⁶⁴ As the CD works on consensus, the US opposition renders the future of the PPWT gloomy.

The PPWT, which is intended to become a legally binding treaty, proposes to prohibit the placement of any weapons in outer space, potentially one of its most significant contributions to the legal regime of space security. At least two definitional issues arise from the proposal, namely: (1) What are “weapons in outer space”?; and (2) What amounts to “placement”?

International law does not provide a legal definition of outer space. Little explicit guidance is provided by domestic laws either.⁶⁵ The 2008 PPWT was one of the very few treaty proposals to make such an explicit definition, i.e. “the space above the Earth in excess of 100 km above sea level”.⁶⁶ It should be mentioned that while state practice has established the area in excess of 100 km above sea level as outer space, the legal status of the area between this line and the upper limit of aerodynamics is not yet clear.⁶⁷ Although the line of 100 km was initially proposed only for the purposes of PPWT,⁶⁸ the definition has been cited by scholars to infer the position of China and Russia on the boundary between airspace and outer space in general.⁶⁹ The 2014 PPWT abandoned this disputed definition, leaving it to be addressed in the future if necessary. As space technologies remain one of the most dynamic areas, the interests of states on whether there should be a clear boundary between outer space and airspace, and if so, where it should be, are not yet clear, in particular with respect to the development of aerospace objects and near-space vehicles.

With the lack of a definition of outer space, the 2014 PPWT defines “weapon in outer space” as:

any outer space object or component thereof which has been produced or converted to destroy, damage or disrupt the normal functioning of objects in outer space, on the Earth’s

64. *Analysis of the 2014 Russian-Chinese Draft “Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force Against Outer Space Objects” (PPWT) (CD/1985), CD/1998.*

65. Jinyuan SU, “The Delimitation Between Airspace and Outer Space and the Emergence of Aerospace Objects” (2013) 78 *Journal of Air Law and Commerce* 355.

66. 2008 PPWT, *supra* note 59, art. 1(a).

67. Jinyuan SU, “Near Space as a Sui Generis Zone: A Tri-layer Approach of Delimitation” (2013) 29 *Space Policy* 90.

68. CD/1872, *supra* note 62.

69. Tanja MASSON-ZWAAN and Steven FREELAND, “Between Heaven and Earth: The Legal Challenges of Human Space Travel” (2010) 66 *Acta Astronautica* 1597 at 1603; Kelly Kuan SHANG, “Trespass to Airspace: How to Deter North Korea from Its Space Ambitions?” (2013) 6 *Journal of East Asia and International Law* 221 at 232.

surface or in its atmosphere, or to eliminate human beings or components of the biosphere which are important to human existence, or to inflict damage on them by using any principles of physics.⁷⁰

Hence, a weapon in outer space is first of all an outer space object or component thereof. “Outer space object”, which is not defined in the existing international law of outer space, is defined in the 2014 PPWT as “any device placed in outer space and designed for operating therein”.⁷¹ Abandoning the various enunciations in the 2008 PPWT, the definition is now simplified and linked to the definition of “placement” as one of its qualifications, apart from the requirement of being designed to function in outer space. Therefore, an outer space object needs to fulfil both the spatial criterion and the functional criterion. As to the spatial criterion, a device is considered to have been “placed in outer space” if “it orbits the Earth at least once, or follows a section of such an orbit before leaving that orbit, or is permanently located in outer space or on any celestial bodies other than the Earth”.⁷² Ballistic missiles, Prompt Global Strike (PGS) systems, and suborbital flights for point-to-point transportation which traverse through outer space temporarily arguably amount to placement in outer space, as they “follow a section of an orbit before leaving that orbit”. But they do not fall within the scope of outer space objects as defined by the 2014 PPWT, because they do not fulfil the functional criterion of being designed for operation in outer space. Reusable spacecraft, such as the Boeing X-37 series, on the other hand, arguably fall within the definition.

In addition, a “weapon in outer space” should have been “produced or converted to destroy, damage or disrupt the normal functioning of objects in outer space, on the Earth’s surface or in its atmosphere, or to eliminate human beings or components of the biosphere which are important to human existence, or to inflict damage on them by using any principles of physics”.⁷³ The distinguishing line for an object to be considered a weapon in outer space is “production and conversion” for hostile purposes or use. This covers not only dedicated weapons in outer space, but also civil and commercial space objects converted for hostile use.

As far as the targets are concerned, weapons in outer space may be directed at objects in outer space, on the Earth’s surface (including land and sea), or in its atmosphere, as well as human beings or components of the biosphere important to human existence. The destructive power of weapons in outer space may vary significantly from eliminating, destroying, and damaging to disrupting, regardless of the law of physics employed.

The PPWT only explicitly prohibits the placement of weapons in outer space with respect to “research, development, testing, placement and use”. It is arguable that the testing of dedicated weapons in outer space also falls within the ambit of prohibition because in order to be tested such weapons need to be placed in outer space first, unless they are tested in a simulated environment on the Earth. As far as dual-use space objects are concerned, although it is unlikely that they would be used as space-to-Earth weapons,

70. 2014 PPWT, *supra* note 63, art. I(b).

71. *Ibid.*, art. I(a).

72. *Ibid.*, art. I(c).

73. *Ibid.*

they can be easily modified to be space-based ASATs. The testing of dual-use technologies such as Active Debris Removal (ADR) is not to be prohibited, unless they are converted or used for the “threat or use of force against outer space objects”, which is prohibited by Article II of the PPWT.

Terrestrial-based ASATs are not explicitly addressed in the 2014 PPWT, nor in the 2008 PPWT, but they are indirectly and partially banned by the obligation “not to resort to the threat or use of force against outer space objects of States Parties to the Treaty”.⁷⁴ This “hostility” formula echoes the Moon Treaty, which prohibits “[a]ny threat or use of force or any other hostile act or threat of hostile act on the Moon”.⁷⁵ The term “use of force” means “any action intended to inflict damage on an outer space object under the jurisdiction and/or control of other States”, and “threat of force” means “the clear expression in written, oral or any other form of the intention to commit such an action”.⁷⁶ The threat or use of force against outer space objects, as prohibited, can be from space-based weapons or terrestrial-based weapons. Therefore, this provision may be interpreted as prohibiting the threat or use of terrestrial-based ASATs. Whereas the research and development of terrestrial-based ASATs clearly remain unlimited by the PPWT, testing is likely unconstrained either, as testing is usually directed against a state’s own satellite.

Article II of the 2014 PPWT reiterates the obligation of non-threat or use of force as enshrined in Article 2(4) of the UN Charter. The two exceptions to the principle, i.e. measures involving the use of armed force authorized by the Security Council to maintain or restore international peace and security and self-defence, also apply to outer space. In this respect, the 2014 version provides that:

Nothing in the present Treaty shall impair the States Parties’ inherent right to individual or collective self-defence, as recognized in Article 51 of the Charter of the United Nations.⁷⁷

Individual and collective self-defence is explicitly mentioned in the 2014 version, as an attempt to respond to criticisms against the 2008 draft which does not mention it.⁷⁸ In fact, having or not having the self-defence provision would not make much difference, because Article III of the Outer Space Treaty recognizes the applicability of the UN Charter to activities in outer space. In addition, as aforementioned, the Charter would prevail if there is any conflict with other treaties.⁷⁹

B. *The ICoC*

Other than the proposal for a binding treaty, there are also initiatives to introduce non-binding instruments to promote arms control. In 2008, the European Union (EU)

74. *Ibid.*, art. II.

75. *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 18 December 1979, 1363 U.N.T.S. 3, 18 I.L.M. 1434 (entered into force 11 July 1984), art. 3(2) [*Moon Agreement*].

76. 2014 PPWT, *supra* note 63, art I(d).

77. *Ibid.*, art. IV.

78. 2008 PPWT, *supra* note 59, art. V, which provides that: “[n]othing in this Treaty may be interpreted as impeding the exercise by the States Parties of their right of self-defence in accordance with Article 51 of the Charter of the United Nations.”

79. *UN Charter*, *supra* note 42, art. 103.

released its proposal for a Code of Conduct for Outer Space Activities (European CoC).⁸⁰ In response to criticisms against its lack of consultations with non-EU states, the EU initiated a series of consultations with other countries. Informal bilateral consultations were undertaken with Brazil, Canada, China, India, Indonesia, Israel, Russia, South Africa, the Republic of Korea, Ukraine, and the US, followed by three rounds of multilateral open-ended consultations, in Kiev (May 2013), Bangkok (November 2013), and Luxembourg (May 2014). Resulting from the consultations, revised versions were released in 2010, 2012, 2013, with the latest version on 31 March 2014.⁸¹ On 16 January 2012, US Secretary of State Hillary Clinton announced that the US had decided to join with the EU and other nations to develop an International Code of Conduct for Outer Space Activities (ICoC).

Although the ICoC does not address military activities in outer space explicitly, its constraints on them are potentially profound, as the code “addresses outer space activities involving all space objects launched into Earth orbit or beyond”.⁸² In spite of the non-binding nature of the code, states are prudent in consultations and contemplation as to whether or not to subscribe to it. Although non-compliance with such instruments does not entail sanctions, the political cost can be very high in the world today, in which states have become unprecedentedly interdependent. That its implications for military activities in outer space are one of the major considerations for states is evidenced by the heavy involvement of arms control departments from many states in the bilateral and multilateral consultations. Even in the US, now a co-sponsor of the ICoC, voices have been uttered in Congress as to the potential impact of the code on the military and the likely lack of consultation with Congress.⁸³

The clause of the ICoC with the closest relevance to military activities in outer space is 4.2, whereby the Subscribing States resolve to “refrain from any action which brings about, directly or indirectly, damage, or destruction, of space objects” unless such action is justified by imperative safety considerations, reduction of the creation of space debris, or the Charter of the United Nations.⁸⁴ The implications of this clause to space weapons can be broken down into the following elements:

1. Space-based ASATs: Section 4.2 can be interpreted as prohibiting the use of weapons in outer space against outer space objects, subject to various exceptions. As it does not make a distinction between space objects of one’s own and those owned by others, it could also be interpreted as prohibiting the testing of space-based ASATs. However, it does not seem to prohibit the deployment of such

80. *Draft Code of Conduct for Outer Space Activities*, 17 December 2008, online: Council of the European Union <<http://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2017175%202008%20INIT>>.

81. *Draft International Code of Conduct for Outer Space Activities*, 31 March 2014, online: EEAS <http://www.eeas.europa.eu/non-proliferation-and-disarmament/pdf/space_code_conduct_draft_vers_31-march-2014_en.pdf> [2014 ICoC].

82. *Ibid.*, 1.2.

83. Michael LISTNER, “Congressional Opposition to a Code of Conduct for Space”, *The Space Review* (6 February 2012), online: The Space Review <<http://www.thespacereview.com/article/2018/1>>.

84. 2014 ICoC, *supra* note 81, 4.2.

weapons in outer space, even if they are dedicated weapons, or the research and development of them.

2. Space-to-Earth weapons: Section 4.2 does not impose any limit on the research, development, testing, deployment, or use of weapons in outer space which are targeted at objects on the Earth.
3. Terrestrial-based ASATs: Section 4.2 could be interpreted as prohibiting the use of terrestrial-based ASATs. As the clause does not make a distinction between space objects of one's own and those owned by others, it appears to prohibit the testing of terrestrial-based ASATs as well.

Therefore, the ICoC does not seem to envisage a weapons-free outer space, yet at the same time it strictly bans the testing and use of terrestrial-based ASATs. This creates imbalances in the missile defence context. It does not prevent states from developing, deploying, or testing space-based Ballistic Missile Defence (BMD) systems, but at the same time other states may feel concerned over the available means to counterbalance a missile defence system.

Doubts have been raised as to the feasibility of banning “weapons” in outer space, as the PPWT attempts to achieve, given the dual-use nature of many space assets. It is posited that building upon the approach to address “behaviours” rather than “hardware” in outer space, the ICoC provides more specific limitations and more precise parameters to any allowable threats to space activities in themselves, as well as threats to the Earth from outer space.⁸⁵ Whereas this appears to be true with respect to space-based ASATs and terrestrial-based ASATs, the code does not adequately address the deployment of weapons in outer space, and the testing and use of space-to-Earth weapons, which are the key source of mistrust that is likely to fuel an arms race in outer space. The mistrust would continue to linger if the door for weapons in outer space remains open. Many states would follow suit to pursue weapons in outer space or choose to develop terrestrial-based ASATs, as states tend to assume the worst on security issues.

In addition, Section 4.2 would permit the use of weapons and dual-use objects in outer space to bring about damage or destruction under certain conditions. Whereas it shares with the PPWT the common ground that the use of weapons in outer space is justifiable by the Charter of the United Nations, i.e. under the circumstances of Security Council authorization and self-defence, the ICoC seems to also allow the use of dedicated weapons and dual-use objects in outer space for imperative safety considerations or for the reduction of the creation of space debris. It should be mentioned that conflicts may arise between the exceptions. For instance, satellite removal without consent of the satellite owner, even for imperative safety considerations or for reduction of the creation of space debris, arguably constitutes use of force as prohibited by the UN Charter. The Charter would always prevail, as it is binding, whereas the ICoC would not create binding obligations, and the Charter also recognizes the supremacy of obligations specified therein.⁸⁶

85. Frans VON DER DUNK, “Cutting the Bread” (2013) 29 *Space Policy* 231 at 233.

86. *UN Charter*, *supra* note 42, art. 103.

C. *Unilateral Commitments of No First Placement of Weapons in Outer Space*

In another initiative parallel to the previous two, in October 2004, at the First Committee of the UN General Assembly, Russia announced a new policy of “no first deployment of weapons in outer space”, and called on all other space-faring and space-using nations to join in this pledge.⁸⁷ The initiative was supported by Russia’s partners from the Collective Security Treaty Organization (CSTO) consisting of six post-Soviet states, which was followed by a few other states: Brazil, Indonesia, Sri Lanka, Argentina, and Cuba have declared with Russia that “they will not in any way be the first to place weapons of any kind in Outer Space, that they will make all possible efforts to prevent Outer Space from becoming an arena for military confrontation and to ensure security in Outer Space activities”, and “call upon Outer Space-faring Nations to follow their example”.⁸⁸ On 23 June 2005, heads of states of the CSTO—consisting of Armenia, Belarus, Kazakhstan, Kyrgyzstan, Russia, and Tajikistan—made a joint statement that they would not be the first to place weapons of any kind in outer space.⁸⁹ In 2014, Russia submitted a draft resolution on no first placement of weapons in outer space to the First Committee of the 69th Session of the UN General Assembly.⁹⁰ The text was approved by a vote of 126 in favour to 4 against (Georgia, Israel, Ukraine, the US), with 46 abstentions. On 2 December 2014, the resolution was adopted by the General Assembly as “No first placement of weapons in outer space”, with the same voting ratio.⁹¹

The unilateral statements led by Russia are important confidence-building measures for the security of outer space. However, in international law unilateral acts may also imply binding obligations, subject to the fulfilment of some conditions. The binding character of an international obligation assumed unilaterally, as the customary principle of *pacta sunt servanda*, is based on good faith. The legal effect of unilateral statements made vis-à-vis the whole world community was addressed by the ICJ in the *Nuclear Tests* case, in which France committed to cease nuclear tests in the South Pacific. The ICJ expounded:

It is well recognized that declarations made by way of unilateral acts, concerning legal or factual situations, may have the effect of creating legal obligations. Declarations of this kind may be, and often are, very specific. When it is the intention of the State making the declaration that it should become bound according to its terms, that intention confers on the declaration the character of a legal undertaking, the State being thenceforth legally required to follow a course of conduct consistent with the declaration. An undertaking of this kind, if given publicly, and with an intent to be bound, even though not made within the context of international negotiations, is binding. In these circumstances, nothing in the

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87. Rebecca JOHNSON, “PAROS Discussions at the 2004 UN First Committee” (20 October 2004), online: Acronym Institute <<http://www.acronym.org.uk/un/2004paro.htm>>.
88. See e.g. *Joint Statement Between the Russian Federation and the Argentine Republic of Not Being the First to Place Arms in Outer Space*, Moscow, 28 May 2014.
89. *Statement by the Heads of State of the Republic of Armenia, the Republic of Belarus, the Republic of Kazakhstan, the Kyrgyz Republic, the Russian Federation and the Republic of Tajikistan*, CD/1755.
90. *Draft Resolution on “No First Placement of Weapons in Outer Space”*, UN Doc. A/C.1/69/L.14 (2014).
91. *No First Placement of Weapons in Outer Space*, GA Res. 69/32 (2 December 2014).

nature of a *quid pro quo* nor any subsequent acceptance of the declaration, nor even any reply or reaction from other States, is required for the declaration to take effect, since such a requirement would be inconsistent with the strictly unilateral nature of the juridical act by which the pronouncement by the State was made.⁹²

Inspired by the *Nuclear Tests* Judgments, the International Law Commission (ILC) adopted “Guiding Principles Applicable to Unilateral Declarations of States Capable of Creating Legal Obligations” at its 58th Session in 2006, and submitted them to the General Assembly as a part of the Commission’s report covering the work of that session. The ILC agreed that the public nature of declarations and the manifestation of the will to be bound are the two primary conditions to establish legal obligations.⁹³ In the *Nuclear Tests* case, the ICJ stated that the assessment hinges on the intention of being bound in relation to a particular matter, which is to be ascertained by interpretation of the act.⁹⁴ Similarly, in the *Case Concerning the Frontier Dispute* between Burkina Faso and the Republic of Mali, it pointed out that “it all depends on the intention of the State in question”.⁹⁵ The views of the ICJ and the ILC are not necessarily contradictory. By referring to the declaration made by Egypt on 24 April 1957 on the Suez Canal and Jordan’s waiver of claims on the West Bank territories, the ILC is of the view that the public nature of declarations represents an important indication of their authors’ intention to commit themselves.⁹⁶

The public nature of Russia’s 2004 unilateral statement at the First Committee of the United Nations General Assembly is evident, given that the General Assembly is one of the world’s most widely represented fora of sovereign states. Its intention to be bound is clear, given the precision of words and the use of “pledge”. The context in which the Russian declaration is made also serves as a positive indication that it is intended to be legally binding. The General Assembly First Committee deals with disarmament, global challenges, and threats to peace that affect the international community, and it seeks out solutions to the challenges in the international security regime, and works in close co-operation with the United Nations Disarmament Commission and the Geneva-based CD. The subsequent bilateral and multilateral declarations, which Brazil, Indonesia, Sri Lanka, Argentina, Cuba, and other States Parties to the CSTO made with Russia, also fulfil the dual requirements. However, for those states which have voted in favour of General Assembly Resolution 69/32 but have not made unilateral statements, simply expressing their appreciation and support of these efforts does not amount to the indication of the intention to be bound, and thus gives rise to no legal obligations. As a matter of fact, the obligations in the resolution were significantly watered down. It only “[e]ncourages all States, especially

92. *Nuclear Tests case (Australia v. France; New Zealand v. France)*, Judgments of 20 December 1974, [1974] I.C.J. Rep. 253 at 267–8, paras. 43, 46; and 472–3, paras. 46, 49 [*Nuclear Tests case*].

93. *ILC Guiding Principles Applicable to Unilateral Declarations of States Capable of Creating Legal Obligations*, UN Doc. A/61/10 (2006), art. 1 [*ILC Guiding Principles*].

94. *Nuclear Tests case*, *supra* note 92, at 457, para. 44.

95. *Case Concerning the Frontier Dispute (Burkina Faso v. Republic of Mali)*, Judgment of 22 December 1986, [1986] I.C.J. Rep. 554 at 573, para. 39.

96. *ILC Guiding Principles Applicable to Unilateral Declarations of States Capable of Creating Legal Obligations, with Commentaries Thereto*, UN Doc. A/61/10 (2006), 369 at 370.

space-faring nations, *to consider the possibility of upholding as appropriate a political commitment not to be the first to place weapons in outer space*".⁹⁷

Another essential element is the specific author of such statements, relating to who can legally represent the state. In the *Nuclear Tests* case, the ICJ found without doubt that statements by the heads of states and members constitute an engagement of the state.⁹⁸ In the more recent *Armed Activities on the Territory of the Congo* case, it stated that, as a well-established rule of international law, the head of state, the head of government, and the minister for foreign affairs are deemed to represent the state merely by virtue of exercising their functions.⁹⁹ The Court further expounded that "with increasing frequency in modern international relations other persons representing a State in specific fields may be authorized by that State to bind it by their statements in respect of matters falling within their purview".¹⁰⁰ The ILC concurs with this, adding that the key point is that it should be made by an authority vested with the power to do so.¹⁰¹ Russia's policy of no first deployment of weapons in outer space was announced at the UN General Assembly and the CD by its diplomatic representatives, who are presumably duly authorized, given the significance of the issue concerned and the consistency of the policy. The joint statements, on the other hand, were signed between presidents or ministers of foreign affairs bilaterally, while the official declaration of the CSTO was also made by heads of states. As to the addressee, there is no need for such statements to be addressed to a particular state, nor is acceptance by any other state required, for it to have legal effect.¹⁰² The ILC recognizes that unilateral declarations may be addressed to the international community as a whole, to one or several states, or to other entities.¹⁰³ Unilateral declarations without specific addressees, like the above commitments of no first placement of weapons in outer space and the French commitment of ceasing nuclear tests, are presumed to be directed to the international community, potentially giving rise to *erga omnes* obligations.

Having established the legally binding force of unilateral commitments of no first placement of weapons in outer space, the question arises as to the interpretation of concrete legal obligations incurred by the commitments. The ICJ and the ILC share the common understanding that when states make statements by which their freedom of action is to be limited, a restrictive interpretation is called for.¹⁰⁴ The pledge of no first placement of weapons in outer space can be broken down into the following components:

1. By using the words "not be the first", the pledge is conditional. Any other state or private entity's deployment of weapons in outer space in the first place would free them from the negative undertaking.

97. *No First Placement of Weapons in Outer Space*, GA Res. 69/32 (2 December 2014), para. 5 (emphasis added).

98. *Nuclear Tests case*, *supra* note 92, at 457, para. 49.

99. *Case Concerning Armed Activities on the Territory of the Congo (New Application: 2002) (Democratic Republic of the Congo v. Rwanda)*, Judgment of 3 February 2006, Jurisdiction of the Court and Admissibility of the Application, [2006] I.C.J. Rep. 6 at 24, para. 46.

100. *Ibid.*, at 24, para. 47.

101. *ILC Guiding Principles*, *supra* note 93, art. 4.

102. *Nuclear Tests case*, *supra* note 92, at 457, para. 50.

103. *ILC Guiding Principles*, *supra* note 93, art. 6.

104. *Nuclear Tests case*, *supra* note 92, at 457, para. 44; *ILC Guiding Principles*, *supra* note 93, art. 7.

2. “Weapons in outer space” are the objects of the pledge, which could be space-to-space weapons or space-to-Earth weapons, but not terrestrial-based ASATs. By reference to the PPWT, which also reflects the Russian policy, dual-use outer space objects are not limited, unless they are converted or used to serve hostile purposes.
3. The act constrained in connection with weapons in outer space is deployment. Research and development of such weapons are not limited by the pledge. It is arguable that to refrain from testing them is within the ambit of negative undertakings, because in order to test weapons in outer space they would be deployed in outer space first, unless testing is done in a simulated environment on Earth. “Deployment” in its legal meaning is similar to “placement”.

Like the PPWT, the unilateral commitments suffer from the shortcomings of failing to address terrestrial-based ASATs and the possibility of building break-out capability by developing dual-use technologies. Furthermore, the conditional legal obligations can be discharged by revoking the declarations. However, the contribution of these commitments to space security should not be underestimated, as they demonstrate states’ commitment to space security and their willingness to co-operate. For the pledging states, they remain in control of their security interests by conditioning the self-imposed constraints on their expectation on other states’ similar undertakings. For other states, the commitments provide certainties in their perception of others. With the lack of contractual obligations, the game of space arms control imitates the “prisoner’s dilemma”, in the sense that states are likely to choose not to co-operate even if it appears that it is in their best interests to do so.¹⁰⁵ By fostering a positive atmosphere, the unilateral commitments help to dilute the mistrust between states.

D. *An Assessment*

1. *Weapons in outer space versus terrestrial-based ASATs*

The primary-level obligations of space arms control that the above three major initiatives envisage vary significantly. It appears that the PPWT is more effective in prohibiting dedicated weapons in outer space, whereas the ICoC is more effective in prohibiting terrestrial-based ASATs.

The different emphases of current space arms control initiatives reflect the different security concerns of sponsoring states. Weapons in outer space, for instance, include space-to-Earth weapons and space-based ASATs. Postulated space-to-Earth weapons include kinetic kill satellites and space-based missile defence interceptors. Concepts of the former date back to the 1960s. However, so far, airborne, sea-based, and ground-based capabilities have been more effective options.¹⁰⁶ What some states are concerned with is the practical implication of space-to-Earth weapons to missile defence and nuclear deterrence. The possibility of placing weapons in outer space, for

105. See generally, “Prisoner’s Dilemma”, 29 August 2014, online: Stanford Encyclopedia of Philosophy, <<http://plato.stanford.edu/entries/prisoner-dilemma/>>.

106. Brian WEEDEN, “National Security and Military Uses of Outer Space”, Lecture at McGill Strategic Space Law Course, Montreal, 27–31 October 2014, online: McGill <http://swfound.org/media/179251/BW_NationalSecurityUsesofSpace_McGill_Oct2014.pdf>.

missile defence or other purposes, prompted the development and testing of ASATs. That a new round of terrestrial-based ASAT tests began following the US abrogation of the 1972 Anti-Ballistic Missiles Treaty in 2002 was no coincidence. The lack of any limit on space-to-Earth weapons at any point along the chain of “research, development, testing, deployment and use” is potentially one of the most significant shortcomings of the ICoC from a security perspective. To garner wider support, it may need to redefine its scope of application to focus on civil and commercial activities, or to close the door to weapons in outer space if it were to stick to its current all-encompassing scope.¹⁰⁷ As China stated at the First Committee of the 68th Session of the General Assembly in 2013:

China appreciates the EU’s efforts to promote a draft International Code of Conduct for Outer Space Activities (ICoC), and has participated in the discussion process in a constructive manner. Meanwhile, we believe that the ICoC, as a voluntary outer space TCBM, should focus on peaceful uses of outer space, and should by no means dilute the work on PAROS in the CD. The ICoC process should ensure broad participation on an equal and open basis, and fully accommodate substantive or procedural concerns of relevant parties, so as to conclude an international code of conduct acceptable to all.¹⁰⁸

Terrestrial-based ASATs, on the other hand, are “the most pressing, existing threat to outer space systems” to the US. One of the reasons for its opposition to the PPWT is the lack of explicit prohibition of terrestrial-based ASATs.¹⁰⁹ The strength of the ICoC in this regard presumably contributes to its endorsement by the US. Due to the vulnerability of space assets, space is regarded as the “Achilles’ Heel” of the state most reliant on them, making terrestrial-based ASATs its major concern. The first ASAT test arguably dates back to October 1958, when the US launched a missile interceptor from a B-47 aircraft, as part of its Project *Bold Orion*, to within four miles of the *Explorer 6* satellite at an altitude of 156 miles. In those days, it was the former Soviet Union that was in the leading position of the space race. Soon surpassed by the US, the former Soviet Union also began to develop and test ASATs in the late 1960s and early 1970s. Studies during both the Nixon administration and the Ford administration concluded that ASATs would not be effective tools for deterrence, because the US was more dependent upon space satellites.¹¹⁰ From then on, the US has been pursuing the policy against terrestrial-based ASATs, while maintaining a certain level of capacity. Today, the US, which operates nearly half of the satellites in orbit, remains the state most reliant on space assets. To garner its support, the PPWT at least needs to include a new provision on terrestrial-based ASATs.

Terrestrial-based ASATs do not necessarily concern the US exclusively. With the increase of space-faring countries, and the expansion of space exploration and use, this

107. Jinyuan SU, “The European Union Draft Code of Conduct for Outer Space Activities: An Appraisal” (2014) 30 *Space Policy* 34.

108. SHEN Jian, “Statement at the Thematic Debate on Outer Space at the First Committee of the 68th Session of the UNGA, 28 October 2013”, online: <<http://www.china-un.org/eng/hyyfy/t1094040.htm>> (TCBM = Transparency and Confidence Building Measures).

109. CD/1998, *supra* note 64.

110. Paul B. STARES, *The Militarization of Space: US Policy, 1945–1984* (Ithaca, NY: Cornell University Press, 1985) at 164–71.

concern will be shared by more and more major space-faring countries and the international community which benefit from space utilizations. Taking Global Navigation Satellite System (GNSS) as an example, apart from the American Global Positioning System (GPS) and the Russian Global Navigation Satellite System (GLONASS), which are globally operational, the EU's construction of a fully operational Galileo is underway, and China is in the process of expanding its regional *Beidou* into the global Compass navigation system by 2020. In addition, India and Japan are also developing their own regional navigation systems.¹¹¹ Against this background, pursuing ASATs is ultimately against space-faring countries' own interests. However, space may become a new target for terrorism, as warned by the European Space Policy Institute (ESPI) in its recent report.¹¹²

Although the development and testing of ASATs seem to be prompted by the possibility of deployment of weapons in outer space, it is argued that passive military use of outer space would inevitably lead to their use.¹¹³ The employment of satellites in recent conflicts, for intelligence, surveillance, and reconnaissance (IRS), has made space a fourth domain of military conflict. For instance, in the First Gulf War, which is regarded as the first occasion on which a full range of military space systems were used in a conflict against another power, around sixty Western military satellites were directly involved in communications, navigation, surveillance, and early warning.¹¹⁴ Such passive military use of outer space in conflicts is not constrained by international law. They are even credited by some writers for shortening wars and saving lives.¹¹⁵ Nevertheless, these space objects run the risk of becoming legitimate military objectives. Article III of the Outer Space Treaty recognizes the applicability of general international law to activities in outer space, which includes not only *jus ad bellum* but also *jus in bello*. The latter limits military objectives to "those objects which by their nature, 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".¹¹⁶ It is arguable that satellites for IRS, which make an effective contribution to military actions, may be targeted legally where the total or partial destruction, capture, or neutralization of them can offer a definite military advantage. Whereas military satellites offering passive military functions, by their nature, fall within this category, civil and commercial satellites contracted for the same service may also qualify as military objectives.

111. See generally, United Nations Office for Outer Space Affairs, *Current and Planned Global and Regional Navigation Satellite Systems and Satellite-based Augmentations Systems* (United Nations, 2010).

112. ESPI, "The Need to Counter Space Terrorism – A European Perspective", ESPI Perspectives No 17, January 2009.

113. Armstrong, *supra* note 22.

114. Sir Peter ANSON Bt and Dennis CUMMINGS, "The First Space War: The Contribution of Satellites to the Gulf War" (1991) 136 *The RUSI Journal* 45.

115. *Ibid.*, at 53.

116. *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 U.N.T.S. 3, 16 I.L.M. 1391 (entered into force 7 December 1978), art. 52, para. 2 [*Protocol I to the Geneva Conventions*]. Even though not all states have signed the Protocol (notably the US), it is still useful in identifying those rules considered to be applicable according to customary law. See generally, Henckaerts and Doswald-Beck, *supra* note 29.

The development and testing of ASATs seem inevitable given the passive military use of outer space. However, in armed conflicts, states are not free to employ military measures against any object. As a basic rule, the Parties to a conflict shall at all times distinguish between civilian objects and military objectives, and accordingly shall direct their operations only against military objectives.¹¹⁷ In addition, belligerent states are required to take constant care to spare the civilian population, civilians, and civilian objects in the conduct of military operations.¹¹⁸ Nowadays, it is increasingly difficult to make a clear-cut distinction between civilian and military satellites, as in many cases an object in outer space provides dual functions simultaneously. For instance, the GPS provides civilian services, but GPS-guided bombs, such as the Joint Direct Attack Munition, were used during the 1999 air war over Serbia and in Operation Enduring Freedom in Afghanistan from 2001 to 2003.¹¹⁹ In 2002, an orbiting NASA satellite provided the US Air Force with before-and-after hyperspectral imagery of bombed targets in Afghanistan.¹²⁰ As an attack on such dual-use space objects may cause catastrophic collateral damage to civilians, the anticipated military advantage would need to be very high to justify an attack on them, in order to fulfil the requirement of proportionality.

Apart from civilian considerations, the assessment of military necessity and proportionality is also subject to the requirement of environmental protection. In this connection, the ICJ held in the *Nuclear Weapons Advisory Opinion* case that:

States must take environmental considerations into account when assessing what is necessary and proportionate in the pursuit of legitimate military objectives. Respect for the environment is one of the elements that go to assessing whether an action is in conformity with the principles of necessity and proportionality.¹²¹

In a more elaborative manner, Protocol I to the Geneva Conventions stipulates:

Furthermore, care shall be taken in warfare to protect the natural environment against widespread, long-term and severe damage. This protection includes a prohibition of the use of methods or means of warfare which are intended or may be expected to cause such damage to the natural environment and thereby to prejudice the health or survival of the population.¹²²

The use of kinetic ASATs in armed conflicts is likely to create large amounts of space debris, causing “widespread, long-term and severe damage” to the space environment. First, the debris may extend hundreds of kilometres, thus being “widespread”. Second, such damages to the space environment are likely “long-term” due to the fact that they

117. *Protocol I to the Geneva Conventions*, *supra* note 116, art. 48.

118. *Ibid.*, art. 57, para. 1.

119. Patricia A. MCFATE, “Arms Control in Outer Space” in Jeffrey A. LARSEN, ed., *Arms Control: Cooperative Security in A Changing Environment* (Boulder, CO/London: Lynne Rienner Publishers, 2002), 291 at 292.

120. *Ibid.*, at 291.

121. *Nuclear Weapons Advisory Opinion case*, *supra* note 19 at 214, para. 29.

122. *Protocol I to the Geneva Conventions*, *supra* note 116, art. 55, para. 1.

are unlikely to decrease in a short span of time by natural decay, unless they can be removed by cost-effective measures. Research shows that debris in orbits higher than about 800 km above the Earth's surface will be up there for decades, above 1,000 km for centuries, and above 1,500 km effectively forever.¹²³ Third, the damages are likely "severe", given the serious threats posed to orbiting satellites and human space missions. Space debris moves at an extremely high speed of 27,000 km per hour; even tiny pieces can cause destruction to a satellite.¹²⁴

The potential serious environmental damages and the unprecedentedly overt dual-use nature of space assets raise the bar to a very high level for the necessity and proportionality of using kinetic ASATs against space assets in conflicts. Belligerents are more likely to use lower-degree force, such as interference and temporary disablement. It is also interesting to note that, during the 1991 Gulf War, both the coalition troops and Iraqi forces used channels for communication on ARABSAT, a satellite dedicated to Middle East communications and run by the Arab Satellite Communications Organization, raising questions as to the usefulness of designations such as "friendly" and "enemy" satellites.¹²⁵ Whether a norm of armed conflict according a special status of space assets for passive military use may arise remains to be seen.

In summary, the development and testing of terrestrial-based ASATs are largely prompted by the possibility of placing weapons in outer space. Although they are also partly driven by the passive military use of outer space, international humanitarian law, as applied to outer space, does not seem to allow the use of any terrestrial-based ASATs in conflicts. It is thus important to ban both categories of space weapons.

2. *Dual-use space objects*

The difficulty of properly defining the notion of "weapon" in outer space, where so many software and activities are of a dual-use character, casts doubt on the effectiveness of the PPWT.¹²⁶ Dual-use space technologies, if properly used, can contribute to the common interest of all humankind; but they can also be used for hostile purposes. The PPWT attempts to address this issue with two aspects. First, any outer space object "converted" for hostile purposes would become a weapon in outer space, thus its deployment is prohibited. Second, using any outer space object to attack or threaten to attack other objects therein is prohibited by the non-threat or use of force clause. But the testing, deployment, and use of space objects for such purposes as ADR and NEO diversion are not to be prohibited. This gives rise to concerns over the possibility of building readily deployable space-based weapons with break-out capability.¹²⁷ With criticisms lodged against the PPWT, it seems to have been largely neglected that the ICoC does not address the dual-use issue in an effective manner either, as it could be

123. Joel R. PRIMACK, "Debris and Future of Space Activities" in James Clay MOLTZ, ed., *Future Security in Space: Commercial, Military, and Arms Control Trade-offs*, Monterey Institute Center for Nonproliferation Studies and Mountbatten Centre for International Studies, Occasional Paper No. 10, July 2002, 18.

124. *Ibid.*

125. McFate, *supra* note 119 at 292.

126. See e.g. von der Dunk, *supra* note 85.

127. CD/1998, *supra* note 64.

argued that the test and deployment of these objects are for imperative safety considerations and the reduction of the creation of space debris.

Just as a vehicle for transportation can also be used in manslaughter, a satellite used for removing debris can also grab another state's satellites without its consent. The law does not prohibit vehicles, but rather criminalizes the misuse of them for murder. Therefore, to ban the conversion of satellites into weapons and the use of satellites as weapons is perhaps the best that the law could do regarding the dual-use problem. The same is held true with respect to ICBMs, which can be easily converted into terrestrial-based ASATs. Whereas the ICoC can be interpreted as prohibiting the testing and use of ICBMs against space objects, the PPWT can achieve the same if it includes a separation provision on terrestrial-based ASATs.

3. *Hard law versus soft law*

Another difference between the PPWT and the ICoC is that the former is intended to be a legally binding international treaty, while the latter will provide non-binding guidelines. The distinction is captured by the terms "hard law" and "soft law", each of which has its own advantages. Whereas hard law offers credible commitments, reduces transactions costs, and increases enforceability, soft law can lower contracting costs and sovereignty costs.¹²⁸ It is also observed that soft-law instruments are free from constitutional and other domestic legal requirements which exist in most democracies for entry into force of treaties, and they can induce a reluctant state to become a party.¹²⁹ For instance, the ICoC, if endorsed by the US, would not require ratification by its Senate, whereas an international treaty would. Soft law is thus increasingly used in fields such as environmental protection and human rights protection, and more recently arms control, an example being the Hague Code of Conduct against Ballistic Missile Proliferation.¹³⁰ Since the end of the "golden age" of space legislation in 1979, the development of regulations on space activities has featured the making of soft law, on such areas as direct broadcasting, remote sensing, and nuclear power sources. Recent years have also witnessed the tendency of its use in space arms control.

The interplay between soft law and hard law presumably also contributes to the increasing use of the former. Soft-law instruments can be used to generate support for the promulgation of treaties, and to help generate customary international law norms.¹³¹ The Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space¹³² and Principles Relevant to the Use of Nuclear Power Sources in Outer Space¹³³ serve as good examples. While substantial portions of

128. Kenneth W. ABBOTT and Duncan SNIDAL, "Hard and Soft Law in International Governance" (2000) 54 *International Organization* 421 at 426.

129. Richard L. WILLIAMSON, Jr., "Hard Law, Soft Law, and Non-Law in Multilateral Arms Control: Some Compliance Hypotheses" (2003) 4 *Chicago Journal of International Law* 59 at 63.

130. *Hague Code of Conduct Against Ballistic Missile Proliferation*, online: US Department of State <<http://www.state.gov/t/isn/trty/101466.htm>>.

131. Jeffrey L. DUNOFF, Steven R. RATNER, and David WIPPMAN, *International Law: Norms, Actors, Process*, 2nd ed. (New York: Aspen, 2006) at 95.

132. *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, GA Res. 1962(XVIII) (13 December 1963).

133. *Principles Relevant to the Use of Nuclear Power Sources in Outer Space*, 14 December 1992, GA Res. 57/68.

the Principles Declaration were subsequently codified in the Outer Space Treaty, the NPS Principles, which are written in somewhat mandatory language and have been consistently complied with by states, have arguably become part of customary international law.¹³⁴

It seems that the fundamental point of disagreement between major space-faring countries is not whether hard laws or soft laws are more effective in space arms control. Illustrative is that the recently established UN Group of Government Experts (GGE), which consists of independent experts but is nevertheless heavily influenced by states, managed to reach an agreement on Transparency and Confidence Building Measure (TCBMs).¹³⁵ The key disagreement is rather on the substantive obligations of space arms control per se, namely whether it is more urgent to address weapons in outer space or ASATs. It is predicted that where powerful states disagree on policy, they are likely to “engage in forum shopping in such situations, advancing their interests by pressing for the adoption of legal provisions, both hard and soft, in forums that are most favourable to their respective positions.”¹³⁶ This seems to be what is happening in the field of space arms control today.

III. COMPLIANCE AND VERIFICATION

Compliance and verification are secondary-level obligations in arms control. Whereas compliance is the ultimate goal, verification is one of the major means of ensuring that this goal is achieved. The latter consists of a process of gathering and compiling evidence, and a judgement on whether certain verification standards have been met.¹³⁷ In practice, primary-level and secondary-level obligations are intertwined and interactive. On the one hand, primary-level obligations of arms control are designed in such a manner that they can afford a mutually acceptable degree of common security, on the assumption that they will be fully observed. On the other hand, in reality the degree of verifiability varies substantially in different primary-level obligations, and in some cases only intrusive verification measures such as on-site inspections can detect possible violations. The conflict between such measures and state sovereignty would most often end up with the triumph of the latter. This would in turn cause a backlash to the acceptability of primary-level obligations incumbent upon states.

Today’s world is probably no longer as anarchical as Thomas Hobbes portrayed,¹³⁸ but arms control is definitely an area predominated by mistrust among states. Hence verification is often regarded as an indispensable part of arms control arrangements. For instance, the current US National Space Policy maintains that it only considers

134. For a discussion, see e.g. Ricky J. LEE and Steven FREELAND, “The Crystallisation of General Assembly Space Declarations into Customary International Law” (2004) 46 *Proceedings of the Colloquium of the Law of Outer Space* 122.

135. *Group of Governmental Experts on Transparency and Confidence-Building Measure in Outer Space Activities*, UN Doc. A/68/189* (2013).

136. Gregory C. SHAFFER and Mark A. POLLACK, “Hard vs. Soft Law: Alternatives, Complements, and Antagonists in International Governance” (2010) 94 *Minnesota Law Review* 706.

137. Marie Isabelle CHEVRIER, “Verifying the Unverifiable: Lessons from the Biological Weapons Convention” (1990) 9 *Biotechnology and International Conflict* 94.

138. See generally, Noel MALCOLM, *Thomas Hobbes: Leviathan* (Oxford: Oxford University Press, 2012).

proposals and concepts for arms control measures if “they are equitable, *effectively verifiable*, and enhance the national security of the United States and its allies”.¹³⁹ There are some arms control treaties that do not contain a verification regime, such as the Partial Test Ban Treaty and the Outer Space Treaty. However, this would in no manner reduce the importance of ensuring compliance in arms control treaties. Nor could it be generalized that verification is dispensable in arms control.

Multiple reasons have contributed to the absence of a verification regime in such treaties, notably the capability of verifying compliance with unilateral measures, and the marginal strategic advantages to be gained from violations. First, the lack of a verification regime does not mean that adherence cannot be monitored at all, as verification could also be carried out with unilateral measures. Without a collective verification arrangement, violations may be detectable with a states’ own surveillance facilities. For example, the lack of a verification regime in the Partial Test Ban Treaty became mutually acceptable to the former USSR, the US, and the UK after years of negotiations, largely because by 1963 nuclear explosions in the atmosphere, in outer space, and under water had become easily detectable with surveillance satellites.¹⁴⁰ The treaty was a watered-down version of the Comprehensive Test Ban Treaty (CTBT), after states failed to reach a consensus on on-site inspections, which were regarded as necessary to verify underground nuclear tests.¹⁴¹ Second, for some arms control obligations, violations do not bring substantial strategic advantages. The Seabed Arms Control Treaty serves as a good example, as ultimately the placement of nuclear weapons on the sea bed is not a militarily valuable scenario.¹⁴² Cleminson wrote in the early 1990s that most of the multilateral arms control agreements to that date had dealt with weapons systems which were not the most serious security concerns, with the notable exception of the Nuclear Non-Proliferation Treaty (NPT).¹⁴³ The same holds true even today, as no substantial progress in arms control has been made during the last two decades.

For the control of conventional weapons in outer space and terrestrial-based ASATs, verification appears requisite, given today’s technical feasibility and the significant strategic advantages to be derived from violations. The questions that remain to be considered are: (i) whether national means of detection are sufficient to monitor compliance, and if not; (ii) whether it is possible to design a mutually acceptable and effective verification arrangement, and if not; (iii) whether the *laissez-faire* scenario or an imperfect arrangement of space arms control affords more security.

The technical difficulty of verifying compliance varies significantly on different points along the chain of “research, development, testing, placement and use” of space

139. *National Space Policy of the United States of America* (28 June 2010), online: White House <https://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf> at 7 (emphasis added).

140. US Department of State, “Signatory List of Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water”, online: US Department of State <<http://www.state.gov/t/isn/4797.htm#treaty>>.

141. *Ibid.*

142. Jozef GOLDBLAT, *Arms Control: The New Guide to Negotiations and Agreements* (London: Sage Publications, 2002) at 167, 180.

143. F. Ron CLEMINSON, “Multilateralism in the Arms Control and Verification Process—A Canadian Perspective” in Nicolas Mateesco MATTE, ed., *Arms Control and Disarmament in Outer Space*, Vol. II (Montreal: CRASL McGill University, 1987) at 43–4.

weapons. The testing and use of conventional weapons in outer space and terrestrial-based ASATs that create debris are easily detectable with current space surveillance technologies. The US, Russia, and Europe have elaborate space surveillance capabilities.¹⁴⁴ On-orbit manoeuvres and rendezvous of satellites can be ambiguous as they are not necessarily tests of co-orbital systems, but also could be tests of an on-orbit inspection capability.¹⁴⁵ The placement of weapons in outer space, dedicated or residual, is probably difficult to verify due to the currently very weak legal regime of registration for space objects launched into outer space. For the research and development of both categories of space weapons, which can be conducted quite secretly, and the deployment of terrestrial-based ASATs, given their shrinking size and increasing mobility, even highly intrusive measures such as on-site inspections cannot guarantee effective verification. In addition, given the very high level of confidentiality and sensitivity of space activities, it is unlikely that such intrusive verification measures would be accepted by space-faring countries.

What renders verification even more difficult is the technical similarity between terrestrial-based ASATs and ICBMs, and the dual-use nature of space-based technologies such as ADR. The US thus holds that it is not possible with existing technologies and/or co-operative measures to effectively verify an agreement banning space-based weapons.¹⁴⁶ This view is shared by China and Russia.¹⁴⁷ It could be summed up that national and international means are insufficient to verify compliance with a comprehensive ban on space weapons.

Verifiability stands as a major impediment to the progress of space arms control initiatives. Due to the immense technical and political difficulties of verification, current active proposals of space arms control either reserve the issue for future negotiations, or shy away from primary-level obligations that are impossible to verify. The 2008 PPWT is an example of the former, with its Article VI reading:

With a view to promoting confidence in compliance with the provisions of the Treaty and ensuring transparency and confidence-building in outer space activities, the States Parties shall implement agreed confidence-building measures on a voluntary basis, unless agreed otherwise.

Measures to verify compliance with the Treaty may form the subject of an additional protocol.¹⁴⁸

The lack of a verification regime was regarded as one of the major flaws of the 2008 PPWT. Although the proposal did provide for the possibility of negotiating a verification protocol subsequently, the US expressed that it “does not support an

144. David A. VALLADO and Jacob D. GRIESBACH, “Simulating Space Surveillance Networks”, AAS/AIAA Astrodynamics Specialist Conference, 31 July–4 August 2011, Girdwood, Alaska.

145. Brian WEEDEN, “Through a Glass, Darkly: Chinese, American, and Russian Anti-satellite Testing in Space”, online: Secure World Foundation (17 March 2014), <http://swfound.org/media/167224/Through_a_Glass_Darkly_March2014.pdf> at 20.

146. CD/1998, *supra* note 64.

147. *Verification Aspects of PAROS*, CD/1781; CD/1872, *supra* note 62.

148. 2008 PPWT, *supra* note 59, art. VI.

approach in which key legally-binding provisions required for the operation, viability, and effectiveness of an agreement would only be determined through subsequent negotiations".¹⁴⁹ It further reiterated that it is "not possible to develop an effectively verifiable agreement" for the banning of either space-based "weapons" or terrestrial-based anti-satellite systems.¹⁵⁰ In response to the proposal's encouragement of implementing TCBMs, the US is of the view that "any such TCBMs are not substitute for an effective verification regime".¹⁵¹ China and Russia, while submitting that verification is difficult in the context of space arms control, argued that the difficulty of verification shall not impede the facilitation of an early consensus on the prevention of the placement of weapons in outer space and the threat or use of force against outer space objects.¹⁵²

With the difficulties of verification remaining today, the verification provision was only slightly revised in the 2014 PPWT:

The States Parties recognize the need for measures to verify compliance with the Treaty, which may form the subject of an additional protocol.

With a view to promoting confidence in compliance with the provisions of the Treaty, States Parties may implement agreed transparency and confidence-building measures, on a voluntary basis, unless agreed otherwise.¹⁵³

Although the new version explicitly recognizes the need for measures to verify compliance, the US maintains its position that it "could not support an approach in which verification provisions are determined only through subsequent negotiations of an 'additional protocol'".¹⁵⁴ Likewise, the Russian initiative of no first placement of weapons in outer space cannot escape the criticism of unverifiability.¹⁵⁵

If we cannot achieve a perfect space arms control treaty with primary-level obligations which affords common security and which is coupled with verifiability, we may need to concede, and to seek an optimal combination of primary-level and secondary-level obligations. The PPWT currently proposes to ban the testing (deducibly), placement, and use of space-based weapons, and the threat or use of terrestrial-based ASATs. By National Technical Means (NTMs) of verification, the testing and use of dedicated space-based weapons and terrestrial-based ASATs, in particular those based on kinetic physics, are detectable. Therefore, an improvement of the PPWT worthy of consideration is to explicitly prohibit the testing of terrestrial-based ASATs, as testing could cause damage to the space environment. Furthermore, if testing is banned, the technologies of terrestrial-based ASATs are usually too immature for deployment. An exception could be made to allow states to bring down their own

149. CD/1847, *supra* note 61.

150. *Ibid.*

151. *Ibid.*

152. CD/1872, *supra* note 62.

153. 2014 PPWT, *supra* note 63, art. V.

154. CD/1998, *supra* note 64.

155. Rose, *supra* note 6.

satellite, or that of another state upon its request for safety considerations, as the ICoC does. However, such acts should require that they are fully justifiable by imperative necessities, subject to the procedural requirements of Article IX of the Outer Space Treaty, and guided by the COPUOS Space Debris Mitigation Guidelines. As major space-faring countries become increasingly dependent on space, the achievement of such an international consensus is just a matter of time. China and Russia have openly recognized a separate provision banning ASATs as a possible additional element of the PPWT.¹⁵⁶

However, even if the PPWT was revised to this effect, it would not seem to fulfil the criterion of “effective verification”, namely the ability to detect a militarily significant violation in time to respond effectively and to deny the violator the benefit of the violation.¹⁵⁷

First, it is extremely difficult to monitor the testing of terrestrial-based lasers used to blind or “dazzle” the optical arrays of reconnaissance satellites, satellite-frequency jammers, and experimental electromagnetic pulse weapons to destroy satellite circuitry.¹⁵⁸ Such terrestrial-based lasers should be regarded as ASATs, and their use against space objects under the jurisdiction and/or control of other states might amount to “use of force” as defined in Article I(d) of the PPWT, thus falling within the ambit of negative undertakings of its Article II, although not necessarily so according to a more traditional *jus ad bellum*. Whereas their use is perhaps easier to detect and trace, the testing may go unnoticed, and their deployment is hardly verifiable even by the most intrusive measures. Therefore, as far as testing is concerned, a ban on terrestrial-based ASATs is more likely to be limited to kinetic ones, with laser/electronic ones treated separately. This approach has its merits, as one of the primary concerns over kinetic terrestrial-based ASATs is the large amount of debris likely to be generated in peacetime tests and in their use in armed conflicts. In comparison, the testing of laser/electronic terrestrial-based ASATs does not seem to have encountered as many criticisms; their use in armed conflicts also appears to be a more acceptable means of engagement, as discussed above.

Second, it is also extremely difficult to verify parasite ASAT satellites.¹⁵⁹ Many dual-use space technologies being developed today, such as those for ADR and NEO diversion, could also be used for hostile purposes. The testing, deployment, and use of such space objects for peaceful purposes should not be prohibited, and no current space arms control initiative attempts to do so. The PPWT, for instance, only prohibits the use of such space objects for hostile purposes, and the conversion of them for such purposes. Whereas their use is detectable by NTMs, whether a conversion has been made to such objects into space-based ASATs may become a subject of dispute with current space surveillance technologies, which ultimately very few states possess.

156. CD/1818, *supra* note 60, p. 23, para. 158.

157. Paul H. NITZE, “Security Challenges Facing NATO in the 1990s, Address before the Nobel Institute, Leangkollen Seminar, Oslo, Norway, February 6, 1989”, *US Department of State Bulletin* (April 1989), online: <http://www.archive.org/download/departmentofstatb89unit/departmentofstatb89unit_bw.pdf> at 46.

158. McFate, *supra* note 119 at 303.

159. *Ibid.*

However, this negative undertaking, though difficult to verify, is at least better than nothing if we are to keep outer space weapon free. In addition, the Executive Organization envisaged by the PPWT could play an important role in the consideration of matters concerning a possible violation of the treaty,¹⁶⁰ although concrete rules in this connection remain to be expounded.

In contrast to the PPWT, the ICoC, which does not contain a verification regime either, seems to be immune from the unverifiability criticism. This is largely because compliance with it is ultimately voluntary, and it only addresses behaviours in outer space that bring about the damage or destruction of space objects, which are much easier to detect. The ICoC does not address the research, development, or placement of ASATs, or even ASAT attacks that do not create debris. Such proposals are thought to be “effectively verifiable” and far easier to negotiate.¹⁶¹ Whereas the proposal has its merits, in particular in its potential contribution to the safety and sustainability of space activities, in the lens of security it does not contain a balanced primary-level obligation of space arms control. The formulation of arms control obligations should prioritize balanced primary-level obligations, and then be complemented by secondary-level obligations of compliance and verification, although sometimes primary-level obligations may need to be adjusted for the sake of verifiability.

In summary, whereas the PPWT could be adjusted to embrace additional primary-level obligations that are verifiable, such as the testing of kinetic ASATs, it is evident that the verification of testing and deployment of laser/electronic ASATs and dual-use space objects for hostile purposes would remain difficult. The question is which approach brings more security: to stick to the very high criterion of effective verification or to lower the bar. The former would certainly impede the progress of space arms control initiatives. Absent mutual concessions, states would attempt to maximize their own security interest by making full use of outer space for strategic purposes. Lowering the bar for verification would help to achieve a limited ban on space weapons, or at least on the prohibition of the testing, deployment, and use of space-based weapons and kinetic terrestrial-based ASATs.

IV. THE WAY AHEAD

Conventional weapons in outer void space and terrestrial-based ASATs are not explicitly prohibited by the norms of space arms control. Norms of environmental law may limit them indirectly by their external effects or procedural formalities, but they fail to establish objective criteria for the assessment of possible violations. This lacuna is no longer too remote an issue to address. The research, development, and testing of weapons in outer space and terrestrial-based ASATs can be traced back to the Cold War. However, as the two states most dependent on space assets, the former Soviet Union and the US gradually realized that for their common interests in a peaceful outer space, competition needed to be turned into co-operation. By the mid

160. 2014 PPWT, *supra* note 63, art. VI.

161. Ross LIEMER and Christopher F. CHYBA, “A Verifiable Limited Test Ban for Anti-satellite Weapons”, *The Washington Quarterly* (July 2010) 149 at 154.

1980s, they tacitly agreed upon a moratorium on ASAT tests. However, the two decades since the end of the Cold War have witnessed significant changes in geopolitics. As the bipolar counterbalance waned substantially, a new concern arose that the world would enter a unipolar era featuring unilateralism. The US abrogation of the 1972 Anti-Ballistic Missiles Treaty in 2002 was read by some as a sign of this trend, more specifically a step towards weaponizing outer space.¹⁶² It was no coincidence that a new round of terrestrial-based ASAT tests began subsequently. A new arms race in outer space, if it were to happen, would differ from the one during the Cold War, simply because of the increase and diversification of space actors, which make it more difficult to reach an agreement on security matters, and the unprecedentedly overt dual-use nature of space technologies that aggravates distrust among states.

Today, despite the multiple initiatives active in different forums, space arms control seems to be at a deadlock. The underlying fundamental issue is not whether the “hardware” approach or the “behaviour” approach is more effective, or whether hard law or soft law offers more merits, but rather the long-lasting disagreement among major space-faring countries on the primary-level obligations, i.e. the prohibition of space-based weapons and/or terrestrial-based ASATs. In 2009, Canada proposed the adoption of three pledges of space arms control, namely (i) not to test or use a weapon against any satellite so as to damage or destroy it; (ii) not to place any weapon in outer space; and (iii) not to use a satellite itself as a weapon.¹⁶³ However, these ideas have not been promoted actively by the Canadian government subsequently, and have not received much pick-up by other space powers.¹⁶⁴ In consideration of the inadequacies of existing initiatives, a revival of the Canadian initiative, preferably at the CD, is more likely to garner major space-faring countries’ support. Although space-faring countries may dislike some of the pledges, it at least has something that each state does like. There is no doubt that to reach a mutually acceptable agreement demands effort and takes time. But it is important for the international community to initiate negotiations as soon as possible. Note that more than fifty years ago, a large number of states proclaimed in the Partial Test Ban Treaty

as their principal aim the speediest possible achievement of an agreement on general and complete disarmament under strict international control in accordance with the objectives of the United Nations which would put an end to the armaments race and eliminate the incentive to the production and testing of all kinds of weapons, including nuclear weapons.¹⁶⁵

The current disagreement over the primary-level obligations may not always be irreconcilable. We can optimistically pin our hopes on major space-faring countries’

162. See e.g. ZHONG Jing, “Seeking a Better Approach to Space Security” (2003) *The Nonproliferation Review* 1 at 3; Matthew MOWTHORPE, *The Militarization and Weaponization of Space* (Lanham, MD: Lexington Books, 2004) at 196.

163. Paul MEYER, “The Judgment of PAROS: How Best to Prevent an Arms Race in Outer Space” (2012), School for International Studies, Simon Fraser University, Simons Papers in Security and Development, No. 19/2012 at 13.

164. *Ibid.*, at 14.

165. *Partial Test Ban Treaty*, supra note 14, 2nd preambular paragraph.

increasing reliance on space assets to foster an international consensus on the prohibition of terrestrial-based ASATs. For an agreement on the prohibition of weapons in outer space, the recognition that it is impossible to maintain absolute superiority in outer space should be counted on.

For space arms control, an issue with the technical complexities of verification, perhaps a step-by-step approach is more feasible, as the experience of the nuclear tests ban tells us. A “comprehensive” ban is desirable, but not practical with current technologies. Today, whereas the prohibition of testing, deployment, and use of dedicated space-based weapons and kinetic terrestrial-based ASATs are verifiable, uncertainties exist as to the verification of laser/electronic ASATs and the misuse of dual-use space objects for hostile purposes. The international community should therefore pursue a “partial” ban that focuses on the prohibition of the testing and deployment of weapons in outer space and of terrestrial-based kinetic ASATs. Even with this limited arrangement, there is far less risk for international peace and security than a full-scale arms race in outer space, which is likely to happen in the *laissez-faire* scenario. The non-prohibition of laser/electronic ASATs should not exclude the prohibition of weapons in outer space, as weapons in outer space do not offer effective deterrence to laser/electronic ASATs.

As aforementioned, one of the concerns about the effectiveness of prohibiting weapons in outer space is the possibility of building break-out capability by dual-use technologies, such as those in ADR and the diversion of NEOs. International co-operation in these areas would help to dilute the mistrust among states. In addition, on some occasions international co-operation is necessary in order to tackle the legal constraints on actions for common security matters. In ADR, for instance, removal of end-of-life or malfunctioning intact satellites without consent may constitute an intrusion into the jurisdiction and control of other states.

Arms control is one of the major ways of ensuring international peace and security, but not the only one. TCBMs can reduce the risk of miscalculation and misinterpretation. And, ultimately, it is co-operation, rather than legal constraints, that is the panacea for long-lasting international peace and security. If co-operation cannot be carried out in all fields of space exploration and use, it should at least be facilitated in areas where collective actions are needed to cope with the common challenges of space security, such as the proliferation of space debris and the threats posed by NEOs. Co-operation in these areas would help to build confidence among states as to the peaceful use of outer space, and contribute to space arms control.