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NATO and Collective Defense in Space: Same Mission, New Domain

Aurel Sari[*] and Hitoshi Nasu[**]

Abstract

The progressive militarization of outer space presents a range of policy and legal challenges for NATO due to its reliance on space assets for operational effectiveness and the increased vulnerabilities of these assets. Indeed, dependence on space-based assets and services in the conduct of military operations has become something of an Achilles heel for NATO as peer and near-peer competitors are honing their counter-space capabilities. Given the vulnerability of space-based assets and services to hostile interference, the question presents itself whether, and under what circumstances, the collective defense commitment, as set out in Article 5 of the North Atlantic Treaty (NAT), arises in space. NATO's ability and resolve to counter threats in space could be challenged due to the uncertain parameters of the right of self-defense itself when exercised in space and the geographical limits that Article 6 of the NAT imposes on the operation of Article 5 of the NAT.

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In 2019, NATO adopted its first ever space policy and formally recognized outer space as a new operational domain, alongside the existing domains of air, land, sea and cyberspace.[1] The following year, NATO defense ministers announced the creation of a space center at Allied Air Command in Ramstein, Germany, to serve as a focal point for Allied space activities.[2] And on 14 June 2021, at their summit held in Brussels, Allied leaders for the first time formally recognized that "attacks to, from, or within space … could lead to the invocation of Article 5" of the North Atlantic Treaty (NAT).[3]

These developments signal the growing importance of outer space for NATO. By treating space first and foremost as an operational enabler,[4] NATO is preoccupied with enhancing the integration and interoperability of space assets belonging to its member States,[5] rather than preparing to conduct hostilities in space. Indeed, as NATO Secretary General Jens Stoltenberg has emphasized, NATO has no intention of placing weapons in space.[6] This means that NATO is not currently pursuing the development or deployment of counter-space capabilities that deny an adversary's access to or use of space assets.

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1 London Declaration, Issued by the Heads of State and Government participating in the meeting of the North Atlantic Council in London 3–4 December 2019, Press Release (2019) 115, 4 December 2019, https://www.nato.int/cps/en/natohq/official_texts_171584.htm.

2 "NATO Agrees New Space Centre at Allied Air Command," 23 October 2020, https://ac.nato.int/archive/2020/NATO_Space_Centre_at_AIRCOM.

3 Brussels Summit Communiqué, Issued by the Heads of State and Government Participating in the Meeting of the North Atlantic Council in Brussels 14 June 2021, Press Release (2021) 086, 14 June 2021, para. 33.

4 See North Atlantic Treaty Organization, *AJP-3.3, Allied Joint Doctrine for Air and Space Operations*, April 2016, chap. 5.

5 Alexandra Stickings, "Space as an Operational Domain: What Next for NATO?," RUSI Journal 40, no. 9 (2020).

6 "Press Conference by NATO Secretary General Jens Stoltenberg following the Meeting of the North Atlantic Council at the Level of Foreign Ministers," 20 November 2019, https://www.nato.int/cps/en/natohq/opinions_171022.htm.

Even so, the progressive militarization of outer space presents a range of policy and legal challenges for NATO and its member States. These include ever greater reliance on space-based assets and services, their growing vulnerability to disruption and attack, and the continued threat of legal "grey zone" operations by hostile powers.

NATO and Military Operations in Space

Armed forces around the world increasingly depend on space-based assets and services, in particular for communication; intelligence, surveillance and reconnaissance (ISR); and positioning, navigation and timing (PNT). Existing space powers are steadily enhancing their military capabilities, while other actors are investing in space systems at a growing rate. Space has evolved into an essential feature of modern military operations.

In line with this trend, NATO too has become heavily reliant on space in five core areas: positioning and navigation; integrated tactical warning and threat assessment; environmental monitoring for mission planning; command and control communications; and ISR capabilities.[7] For example, ISR platforms were key to effective target acquisition and for minimizing the risk of civilian casualties during Operation Unified Protector conducted by NATO in Libya in 2011.[8]

NATO is not a newcomer to space. The Alliance first began to explore the possibility of operating its own satellites in the mid-1960s. Between 1967 and 2005, it owned and operated four generations of communications satellites and ground stations.[9]

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7 NATO Science & Technology Organization, *Science & Technology Trends 2020-2040* (2020), 76, https://www.nato.int/nato_static_fl2014/assets/pdf/2020/4/pdf/190422-ST_Tech_Trends_Report_2020-2040.pdf.

8 UK House of Commons, Defence Committee, *Operations in Libya: Ninth Report of Session 2010-12* (HC950, 2012) vol. 1, paras 107–8, https://publications.parliament.uk/pa/cm201012/cmselect/cmdfence/950/950.pdf.

9 Donald H. Martin, Paul R. Anderson and Lucy Bartamian, *Communication Satellites* (5th edn, El Segundo, CA: Aerospace Press,

Since then, NATO transitioned from an ownership approach to procuring space-based communication services from its member States. Today, NATO does not have space capabilities of its own, but instead relies on national space assets. In 2019, the NATO Communications and Information (NCI) Agency concluded a memorandum of understanding with France, Italy, the United Kingdom (UK) and the United States (US) for the provision of satellite services until the end of 2034.[10] Yet the distribution of space capabilities across the Alliance is uneven. There is a heavy reliance on the US for intelligence, surveillance, target acquisition and reconnaissance (ISTAR) capabilities, with significant gaps and limitations in the European partners' assets necessary to sustain effective combat operations.[11]

While the use of space assets for military operations is nothing new, recent developments have generated greater awareness of the importance of the space domain. This is primarily due to the increased vulnerability of space assets to a range of technological capabilities designed to degrade, damage or destroy them.[12] Such counter-space capabilities include kinetic kill vehicles, radio frequency jammers, directed energy weapons, and high-power microwaves. Many of these capabilities are ground-based (e.g. anti-satellite (ASAT) missiles), although satellites themselves could be equipped with offensive capabilities to neutralize other satellites in space, for example, through rendezvous and proximity operations (RPOs). Moreover, it should not be

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2007), 191–2, 198–200, 215 and 252. See also P.A. Kelly, "The Evolving NATO Satellite Experience," in *Space Systems as Contributors to the NATO Defence Mission (AGARD CP-580)* (Neuilly-Sur-Siene: Advisory Group for Aerospace Research and Technological Development, 1997) 1.

10 "NATO Begins Using Enhanced Satellite Services," 12 February 2020, https://www.nato.int/cps/en/natohq/news_173310.htm.

11 UK House of Commons (2012), para. 88; Jason R. Greenleaf, "The Air War in Libya," *Air & Space Power Journal*, Vol. 27, Issue 2 (March-April 2013), p. 38.

12 See Tood Harrison et al., *Space Threat Assessment 2021* (Washington DC: Center for Strategic and International Studies, 2021).

overlooked that cyberspace extends into outer space as well, making satellites vulnerable to cyber attacks.[13]

NATO is facing challenges due to its reliance on space assets for operational effectiveness and the increased vulnerabilities of these assets. Indeed, dependence on space-based assets and services in the conduct of military operations has become something of an Achilles heel for NATO as peer and near-peer competitors are honing their counter-space capabilities.[14] During Exercise Trident Juncture in 2018, jamming was reportedly employed to disrupt Global Positioning System (GPS) signals in northern Norway and Finland, causing electronic disturbances for civilian airlines operating in the region.[15]

The hostile exploitation of space-related vulnerabilities is not limited to traditional forms of physical violence, but is more likely to involve covert operations designed to disrupt activities that depend on space-based assets or services, such as command and control, tactical communications and intelligence gathering. For example, PNT signals used for the operation of unmanned aerial vehicles or weapons guidance systems could be spoofed with false coordinates so as to alter their course and target.[16] Such operations can be effective in undermining confidence in the

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13 Beyza Unal, "Cybersecurity of NATO's Space-based Strategic Assets," *Chatham House*, 1 July 2019, https://www.chathamhouse.org/2019/07/cybersecurity-natos-space-based-strategic-assets.

14 Benjamin Silverstein, "NATO's Return to Space," *War on the Rocks*, 3 August 2020, https://warontherocks.com/2020/08/natos-return-to-space/.

15 Christopher Woody, "Finland and Norway Are Telling Airline Pilots to Be Ready to Fly without GPS, and Some Think Russia Is up to Something," *Business Insider*, 9 November 2018, https://www.businessinsider.com/finland-norway-tell-pilots-to-fly-without-gps-and-some-blame-russia-2018-11?r=US&IR=T.

16 See, for example, Andrew J. Kerns et al, "Unmanned Aircraft Capture and Control Via GPS Spoofing," *Journal of Field Robotics*, Vol. 31, Issue 4 (2014), pp. 617–36; Ali Jafarnia-Jahromi et al, "GPS Vulnerability to Spoofing Threats and a Review of Antispoofing Techniques," *International Journal of Navigation and Observation* (2012), p. 16.

functioning of friendly systems and causing defensive systems such as missile early warning to fail at a critical moment. It can be difficult to attribute the origin of directed energy attacks and electromagnetic interference, especially those launched from space-based assets. Moreover, many counter-space capabilities are dual use and capable of carrying out tasks for both military and civilian purposes, which makes it harder to regulate their development and use.

Implications for Collective Defense

NATO is a defensive alliance based on a commitment of mutual assistance. Given the vulnerability of space-based assets and services to hostile interference, the question presents itself whether or not this commitment, as set out in Article 5 of the NAT,[17] actually applies in space.[18] This is not some minor detail. The applicability of Article 5 to threats emanating from outer space goes to the very heart of NATO's credibility and ambitions in this domain.

Article 5 of the NAT is concerned with the exercise of the right of collective self-defense in response to an armed attack. There can be little doubt that incidents amounting to an "armed attack", in the sense the term is used in Article 51 of the Charter of the United Nations,[19] may occur in outer space. For example, the destruction of another State's missile early warning satellite by an anti-satellite missile would clearly amount to a use of force that

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17 See Aurel Sari, "The Mutual Assistance Clauses of the North Atlantic and EU Treaties: The Challenge of Hybrid Threats," *Harvard National Security Journal*, Vol. 10 (2019), p. 405; Michael N. Schmitt, "The North Atlantic Alliance and Collective Defense at 70: Confession and Response Revisited," *Emory International Law Review*, Vol. 34 (2019), p. 85.

18 The question has been raised repeatedly in the past, but rarely answered in depth. See, for example, Jan A. H. van Hoof, "Coalition Space Operations – A NATO Perspective," *High Frontier*, Vol. 7 (2010), p. 8.

19 Generally, see Tom Ruys, *"Armed attack" and Article 51 of the UN Charter: Evolutions in Customary Law and Practice* (Cambridge: Cambridge University Press, 2010).

reaches the gravity threshold of an armed attack.[20] In such a situation, the right of self-defense under Article 51 of the Charter would be engaged, which opens the door to the invocation of Article 5 of the NAT.

At the June 2021 Brussels summit, Allied leaders formally recognized that "attacks to, from, or within space … could lead to the invocation of Article 5" of the NAT.[21] They also underlined that a decision as to when such attacks might lead to an invocation of Article 5 "would be taken by the North Atlantic Council on a case-by-case basis."[22] The Brussels Communiqué thus puts to rest any lingering doubts over the applicability of Article 5 to outer space: NATO leaders unequivocally affirmed that the provision does extend to this domain. The Communiqué also clarifies that Article 5 may apply in three distinct scenarios: where attacks are launched against Allied space assets from Earth; where attacks originating in space are directed against targets elsewhere; and where space-based assets are employed to carry out attacks against other space-based assets. Finally, the Communiqué underlines that there is no automaticity in the operation of Article 5. As in other domains, attacks in or from space engage the duty to provide mutual assistance only following a decision to invoke Article 5.[23]

This lack of automaticity in the operation of Article 5 is prudent. Even when faced with an incident in space that amounts to an armed attack triggering the right of individual or collective self-defense, the Allies are not bound to respond within the framework of Article 5, but may have recourse to other policy options. It is worth recalling that Article 5 has been invoked only on one occasion, in response to the events of September 11, but that this

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20 Cf. *Case Concerning Military and Paramilitary Activities in and against Nicaragua (Nicaragua v. USA)*, Merits, 1986 ICJ Rep. 14, para. 195.

21 Brussels Summit Communiqué, para. 33.

22 Ibid.

23 Cf. Sari (2019), 447.

was neither the first nor the only instance where a member State of NATO has suffered an armed attack.[24]

Assuming that history is an accurate guide in this matter, past practice suggests that it is highly unlikely that the member States of NATO will invoke Article 5 of the NAT in response to an incident in space *unless* it amounts to an armed attack of extraordinary political or strategic significance. Seen from the point of view of a hostile power, the Brussels Communiqué thus confirms what potential adversaries probably knew already: the Allies may decide to invoke Article 5 in reaction to significant incidents, but are unlikely to do so in relation to less severe events, leaving room for exploiting "grey zone" situations.

Strategic Ambiguity: How Much is too Much?

Overall, the Brussels Communiqué sends a strong signal that the Allies are prepared to defend their interests in space, including through the use of force if necessary. However, the clarity of this message is diluted by the uncertainty surrounding the exact conditions which may prompt the Allies to invoke Article 5 in response to an armed attack. This ambiguity may be seen as an asset: leaving hostile powers guessing the exact conditions that could trigger a forceful military response by the Alliance may prompt those powers to proceed with greater caution.[25]

Strategic ambiguity thus has its benefits. However, hostile actors may also read it as a lack of resolve. In the present case, at least two factors may encourage such a reading. The first relates to the uncertain parameters of the right of self-defense itself and the

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[24] Other examples include the invasion of the Falklands in 1982 and the terrorist attacks on Paris in November 2015. Notably, the Paris attacks prompted France to invoke Article 42(7) of the Treaty on European Union, rather than Article 5 of the NAT, to request military assistance from other member States of the European Union. See Outcome of the Council Meeting: 2426th Council Meeting–Foreign Affairs, 14120/15, 17 November 2015.

[25] Cf. UK Ministry of Defence, *Deterrence: The Defence Contribution*, JDN 1/19 (2019), pp. 46–7.

ambiguities that surround its application in space.[26] For example, could non-kinetic interference against space-based assets or services, such as signal jamming, rise to the level of an armed attack? If so, under what circumstances does such interference satisfy the gravity threshold required to constitute an armed attack?[27] Is it lawful to declare a space exclusion zone or to deploy "bodyguard" satellites to defend critical space-based assets in anticipation of an attack in the exercise of the right of self-defense? Having recognized the applicability of Article 5 to space attacks, NATO nations need to develop a shared approach to these and related questions in order to demonstrate unity and resolve.

The second factor relates to the geographical limits that Article 6 of the NAT imposes on the operation of Article 5 of the NAT. The first sub-paragraph of Article 6 deals with attacks on Allied territory. It is clear from the language of this sub-paragraph that armed attacks launched into the territory or islands of NATO members *from or through* space fall squarely within the ambit of Article 5. Armed attacks launched against their assets *in* space are caught by the second sub-paragraph of Article 6, which deals with attacks against the "forces, vessels or aircraft of any of the Parties." While neither the notion of a vessel,[28] nor that of an aircraft,[29] extends to objects primarily designed for operation in outer space, the concept of 'forces' is broad enough to cover

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26 Generally, see Christian Henderson, *The Use of Force and International Law* (Cambridge: Cambridge University Press, 2018).

27 Matthew T. King and Laurie R. Blank, "International Law and Security in Outer Space: Now and Tomorrow," AJIL Unbound, Vol. 113 (2019) p. 129.

28 This is reflected in Article 2(4) of the International Convention for the Prevention of Pollution from Ships, 2 November 1973, 1340 UNTS 184, which defines ships to mean "vessel of any type whatsoever operating in the marine environment and includes hydrofoil boats, air-cushion vehicles, submersibles, floating craft and fixed or floating platforms."

29 Article 1 of Annex 7 to the Convention on International Civil Aviation, 7 December 1944, 15 UNTS 297, defines aircraft as "[a]ny machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface."

spacecraft and their personnel. There is a catch, however. The second sub-paragraph of Article 6 of the NAT refers to attacks taking place "in or over" Allied territories. This means that, at best, attacks against Allied forces in space are covered by Article 5 only whilst in orbit "over" such territories and above their airspace. Accordingly, the destruction of an Allied satellite may engage Article 5 if the satellite was orbiting over the territory of a NATO nation, but not if it was orbiting over the South China Sea, for instance.[30]

NATO nations thus face a dilemma. The geographical limitations imposed by Article 6 of the NAT on the operation of their mutual assistance commitment increases the vulnerability of their space assets to hostile maneuvers by potential adversaries, especially in the Southern Hemisphere where the Alliance has the fewest Space Surveillance Network (SSN) assets. To address this vulnerability, the Allies may consider Article 5 to be applicable to attacks against their space assets wherever they may operate, that is without any geographical restrictions. However, extending the scope of Article 5 to cover *all* around Earth may expose NATO to accusations that it seeks to militarize this domain. Also, such a move would lack credibility unless it is underwritten by capabilities necessary to defend Western space assets and the services they provide.

Ignoring the matter is not an option. China and Russia are known for exploiting legal "grey zone" situations by conducting hostile operations below the traditional threshold of physical violence amounting to an armed attack.[31] They are likely to test NATO's legal readiness and political resolve in the space domain, for example, by using blind spots to undertake nefarious activities

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30 For further detail, see Aurel Sari, "NATO in Outer Space: A Domain Too Far?", *Articles of War*, 1 October 2020, https://lieber.westpoint.edu/nato-outer-space/.

31 See, for example, Lyle J. Morris et al, *Gaining Competitive Advantage in the Gray Zone: Response Options for Coercive Aggression Below the Threshold of Major War* (Santa Monica, CA: RAND Corporation, 2019).

such as co-orbital jamming or RPOs. Strategic ambiguity on the geographical scope of application of Article 5 is likely to invite, rather than deter, such hostile probing.

Concluding Observations: Future Challenges and Opportunities

With a growing number of States ramping up their space arsenal, the vulnerability of space-based assets to a range of counter-space capabilities poses significant challenges to NATO. However, looking ahead to 2030, these challenges also present opportunities that the Alliance can seize to its advantage.

NATO may benefit from increased resilience built in the new generation of space assets available for Allied forces to counter threats to their space-based capabilities.[32] For example, the new generation of European Geostationary Navigation Overlay Service (EGNOS) is expected to augment GPS and its European counterpart, Galileo, to improve the accuracy and reliability of positioning information.[33] The US has also been developing plans to protect critical infrastructure systems, networks and assets relying on PNT services from disruption and manipulation by jamming or spoofing their signals.[34] Moreover, the US Air Force has been deploying Advanced Extremely High Frequency

[32] Madeleine Moon, *The Space Domain and Allied Defence* (Report to the Defence and Security Committee, NATO Parliamentary Assembly, 162 DSCFC 17 E rev. 1 fin, Oct. 8, 2017), para. 63, https://www.nato-pa.int/document/2017-space-domain-and-allied-defence-moon-report-162-dscfc-17-e-rev1-fin; Gregory L. Schulte, "Protecting NATO's Advantage in Space," Transatlantic Current, No. 5 (May 2012), p. 3.
[33] "Developments in Hosted Payloads," *Global Military Communication Magazine* (June/July 2018), p. 16
[34] Executive Order on Strengthening National Resilience through Responsible Use of Positioning, Navigation and Timing Services (Executive Order 13905, 12 February 2020).

satellites, which are capable of protecting communications from jamming.[35]

In addition, further strategic advantages can be gained by the increased use of decoys and other deception tactics in space. The US Joint Doctrine on Space Operations acknowledges that deception is "likely a critical element of any space-system resilience effort."[36] Decoys can be particularly effective in the space environment where there is less physical constraint on the shape, size, or number of decoys to keep them indistinguishable from non-maneuvering satellites, which makes it hard to detect the correct target.[37]

Collective legal diplomacy represents another opportunity for the Alliance to maintain its competitive advantage. Although NATO does not have any intention to challenge or change the international legal framework for space activities, it can provide a forum to discuss and agree upon normative standards to close existing gaps in the interpretation and application of international law in space.[38] General John W. Raymond of the US Space Force recognizes this potential for the development of international norms of responsible behavior in the exploration and use of space environment.[39] NATO has engaged in such collective legal diplomacy for cyber security through funding a multiple year project, which led to the widely acclaimed publication of Tallinn Manual and Tallinn Manual 2.0.[40] As the Brussels Communiqué

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[35] Nathan Strout, "There's a New Anti-Jamming Satellite in Orbit," C4ISRNET, 8 August 2019, https://www.c4isrnet.com/battlefield-tech/c2-comms/2019/08/08/theres-a-new-anti-jamming-satellite-in-orbit/.
[36] *Joint Publication 3-14: Space Operations* (26 October 2020), I-10.
[37] "Contested Space II: Countermeasures," SatelliteObservation.net, 8 March 2018, https://satelliteobservation.net/2018/03/08/contested-space-ii-countermeasures/.
[38] Karl-Heinz Brunner, *Space and Security – NATO's Role* (NATO Science and Technology Committee, Preliminary Draft Special Report, 2 March 2021), para. 72.
[39] John W. Raymond, "NATO Space", speech delivered at the Joint Air & Space Power Conference 2021, https://www.japcc.org/nato-space-2/.
[40] Michael N. Schmitt, ed., *Tallinn Manual 2.0 on the International Law Applicable to Cyber Operations* (Cambridge: Cambridge University Press, 2017); Michael N. Schmitt, ed.. *Tallinn Manual on the International Law*

has underlined, the Alliance remains committed to pursue its space operations in line with international law.[41] It is in the collective interest of the Allies to develop shared understandings and expectations about how international law applies to space operations and to challenge the legality of hostile operations undertaken by peer and near-peer competitors.

Applicable to Cyber Warfare (Cambridge: Cambridge University Press, 2013).

[41] Brussels Summit Communiqué, para. 33.