International Space Strategy

INTERNATIONAL SPACE COLLABORATION AND SECURITY
A NATO PERSPECTIVE

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NATO's Overarching Space Policy model for international collaboration in space sets a unique security framework in the organization's approach to interoperability, defense planning, and deterrence. The policy represents the singular voice of 30 NATO Allies, and its public release was a significant step toward establishing international norms of space behavior. While not a norm-setting organization like the UN, NATO is positioned to be the center of gravity for evolving standards and improving space security for all.

The operationalization of space presents a unique challenge for NATO to secure the Alliance's access to services and capabilities in an unconventional domain, especially considering the range of complex regional threats and global challenges.[1] NATO meets this unique challenge by growing capacity, coordinating capabilities, and collaborating as an alliance for its defense. Specifically, this article will address, as outlined in the Overarching Space Policy, how NATO (1) approaches interoperability within the Alliance, thereby enhancing space domain awareness; (2) coordinates defense planning and capability development at the political and military level; (3) deters potential adversaries through a deterrence-by-denial posture; and (4) sets the stage for the development of proposals of responsible space behavior.[2]

Introduction

Since 2007, four space powers—China in 2007, the United States in 2008, India in 2019, and Russia in 2021—successfully executed direct-ascent antisatellite missions.

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1. North Atlantic Treaty Organization (NATO), *NATO's Overarching Space Policy* (Brussels, Belgium: NATO, January 2022), https://www.nato.int/.

2. NATO, *Brussels Summit Communiqué* (Brussels, Belgium: NATO, July 1, 2022), https://www.nato.int/.

These missions created an excessive amount of debris in low Earth orbit, putting other space systems and, in some cases, humans at risk. Within the same time frame, the number of space launches and subsequent satellites in orbit have increased dramatically, further crowding the space environment.

As of May 2022, there were over 5,400 active satellites in orbit with exponential growth projected by private industry in the next several years.[3] This increasingly "congested, contested, and competitive" environment has created a myriad of disparate international, national, and private enterprise initiatives around the world dedicated to furthering and securing their interests in space.[4] This growth has also significantly increased global dependence on space data, products, and services, a reality adversarial actors are keen to exploit.[5]

But the myriad of space initiatives exploit gaps in established space governance and cause increased fear of collision and threat of malign activity.[6] These fears are rational. A range of counterspace weapons are being developed, most notably by China. Aside from direct-ascent antisatellite technology, adversaries execute nonkinetic or nonpermanent attacks on US satellites "every single day" through lasers, jammers, and cyberattacks.[7] Perhaps more concerning are potential attacks from co-orbital antisatellite weapons that can be used to stalk critical systems in peacetime, only to neutralize these systems during a crisis.[8]

Clearly, global activity in space warrants globally recognized norms of behavior that actively contribute to the security of each actor's satellites while ensuring the long-term sustainability of the domain. "Conventional thinking about how to deter an enemy from attacking on the ground, by sea or in the air doesn't really apply to space. New doctrines and norms for space need to be established, mostly by diplomats."[9] In this context and in consideration of recent initiatives by the UN to further space

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3. Union of Concern Scientists Satellite Database, updated May 1, 2022, https://www.ucsusa.org/; and Michael Sheetz, "The Space Industry Is on Its Way to Reach $1 Trillion in Revenue by 2040, Citi Says," CNBC, May 21, 2022, https://www.cnbc.com/.

4. UN General Assembly, First Committee, Outer Space Increasingly 'Congested, Contested and Competitive,' First Committee Told as Speakers Urge Legally Binding Document to Prevent Its Militarization, GA/DIS/3487 (October 25, 2013), (statement of Jeffrey L. Eberhardt), https://www.un.org/.

5. Jonathan Beale, "Space, the Unseen Frontier in the War in Ukraine," BBC, October 6, 2022, https://www.bbc.com/; and Ashish Dangwal, "Sabotaging Starlink, Russia Is Using EW Complex 'Tirada' to Disrupt SpaceX Satellites Connecting Ukraine – Media," EurAsian Times, October 9, 2022, https://eurasiantimes.com/.

6. Rajeswari Pillai Rajagpalan, "It Is Time for Space Governance Talks," *Diplomat*, May 21, 2020, https://thediplomat.com/.

7. Josh Rogin, "A Shadow War in Space Is Heating Up Fast," *Washington Post*, November 30, 2021, https://www.washingtonpost.com/.

8. Brian G. Chow, "Stalkers in Space: Defeating the Threat," *Strategic Studies Quarterly* 11, no. 2 (Summer 2017), https://www.airuniversity.af.edu/.

9. Rogin, "Shadow War."

governance, NATO's space policy deserves attention, not as much from a legal perspective as from a military perspective.[10]

Among the different governments, companies, and organizations that have given special attention to space, NATO is the largest intergovernmental organization. NATO represents 30 nations and approximately 50 percent of the world's GDP.[11] Unlike the UN, however, NATO has a strategic concept based on collective defense with the three core tasks of deterrence and defense, crisis prevention and management, and cooperative security.[12] Furthermore, the criteria for membership require substantial political, military, and financial obligations.[13] These factors give significant weight to the Overarching Space Policy and how NATO approaches the space domain.

NATO has diplomatic and political intergovernmental functions. The key principles and tenets of the Overarching Space Policy align to ensure "free access" to space for "peaceful purposes" per the Outer Space Treaty of 1967 and other international laws.[14] But the operationalization of space as a contested domain brings new challenges to the international community, even while keeping with the spirit and intent of international law. Unique to NATO as an intergovernmental alliance is its ability to advance international collaboration and security, specifically now concerning outer space.

Interoperability

NATO will encourage cooperation between Allies to enhance the compatibility and interoperability of their space capabilities, including through information sharing (e.g., Space Situational Awareness) and coordination, joint development and production, standardization and related doctrinal, legal and procedural work.

NATO Overarching Space Policy

One of NATO's strengths lies in its interoperability, defined as the "ability for Allies to act together coherently, effectively and efficiently to achieve tactical, operational and strategic objectives."[15] In support of these objectives, NATO considers interoperability from technical, procedural, human, and informational dimensions.

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10. UN General Assembly, Resolution 76/561, Open-ended Working Group on Reducing Space Threats Through Norms, Rules, and Principles of Responsible Behaviors, A/DEC/76/561, (April 26, 2022), https://digitallibrary.un.org/.

11. "NATO Parliamentary Assembly (PA) Membership," NATO PA (website), https://www.nato-pa.int/; and Jens Stoltenberg (speech, NATO's Outlook Towards 2030 and Beyond, Riga, Latvia, November 30, 2021), https://www.nato.int/.

12. "Strategic Concepts," NATO (website), updated July 18, 2022, https://www.nato.int/.

13. NATO Public Diplomacy Division, "NATO Enlargement & Open Door," Fact Sheet (Brussels, Belgium: NATO, July 2016), https://www.nato.int/; and "NATO's Purpose," NATO (website), updated July 4, 2022, https://www.nato.int/.

14. NATO, *Space Policy.*

15. "Interoperability: Connecting Forces," NATO (website), updated February 22, 2022, https://www.nato.int/.

In this context, the technical dimension includes equipment, hardware, and other systems needed to conduct operations effectively. The procedural dimension looks at doctrines and procedures. The human dimension addresses terminology and training. The information dimension considers how information is shared across the Alliance.[16] As a newly established operational domain, space approaches each dimension differently than the other conventional domains, but these dimensions are all still considered in capacity-growing efforts across the Alliance.

Technical interoperability, which includes space systems and hardware, is conceptualized in modeling tools that contribute to space domain awareness and provide a common space picture for NATO operational commanders. These operations are still in the early stages. Currently, NATO does not own or operate space-based assets. In general, military equipment is owned and deployed to NATO by the member nations. Unlike aircraft or similar capabilities where many Allies may purchase the same platform with inherent technical interoperability, space technology involves a high degree of classification, and satellites have been generally designed to meet national purposes alone.

Traditionally, space capabilities are distributed through data, products, and services by a few contributing nations, usually voluntarily or upon specific request. Technical interoperability may unfairly burden less-developed members, including those facing financial hurdles in capability development while balancing national interests. But NATO's space policy does not seek to apportion requirements unnecessarily.[17] The policy provides an opportunity for creative multinational solutions the Alliance requires for security in this unfamiliar domain.

Multiple NATO entities are developing procedural interoperability, including doctrines, procedures, and best practices. These entities work to align efforts across NATO's two strategic commands to operationalize the new domain. These offices include, among others, the NATO Standardization Office (NSO), Allied Command Transformation; NATO's Warfare Development Centre strategic command located in Norfolk, Virginia; the NATO Space Centre of Excellence, currently being established in Toulouse, France; Allied Command Operations, NATO's other strategic command, located in Supreme Headquarters Allied Powers Europe in Mons, Belgium; and the NATO Space Centre located in Ramstein, Germany at Headquarters Allied Air Command.

These commands already integrate data daily from numerous Allies' space operations centers and space entities. This is a critical and initial step in developing a common space operating picture, and preparing missions, activities, and operations in peace and during crises. Data integration and production must be ready and standardized to meet the commander's intent during any future mission.

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16. NATO, "Interoperability."

17. Laetitia Cesari Zarkan, "In Pursuit of the Best Standards: What Material and Legal Interoperability for NATO Forces?," *NATO Legal Gazette* 42 (December 2021), https://www.act.nato.int/.; and NATO, *Space Policy*.

Human interoperability addresses terminology, education, and training, which are critical to clear communication. The human element represents the most important factor in interoperability. Even before NATO recognized space as an operational domain, space cadres were scarce across the Alliance. Despite the space operational interface being inherently digital, this scarcity will only grow more acute as demand for their knowledge increases to meet growing operational requirements. Compounding this, many Allies are trying to increase their own domestic space-domain capabilities while simultaneously supporting NATO's increased needs. Even the United States, with its nascent Space Force, only has a few thousand military space professionals, and there are fewer in other NATO countries.

 To grow capacity, NATO coordinates education and training for its personnel and standardizes a common space lexicon and curriculum for the Alliance. NATO has developed space courses to train personnel without prior space education or training, thereby reducing some reliance on spacefaring member nations to provide specialists. These courses provide foundational operational instruction and an in-depth understanding of processes and procedures for disseminating data, products, and services across the NATO command structure for all missions, activities, and operations from peacetime to crisis.

These courses produce professionals the Allies may also use in helping develop space forces in their own countries. The challenge for NATO and its member states moving forward is not only training new specialists to carry out space requirements but also educating the other forces to understand how space enables their own domains. This awareness will affect how NATO addresses future threats.[18]

Information interoperability is a critical cross-functional element and is related to intelligence preparation of the operational environment. NATO is familiar with combined air, maritime, and land intelligence processes as they apply to the Alliance, but the focus on space has added complications.[19] National classification of space data products and services has traditionally been a significant hurdle to interoperability.[20] In this case, the intent of overclassification to protect technology or means of collection may risk the overall goal of international collaboration and deterrence. With increased incentives to share more information, each Ally must negotiate internal national procedures.

The NATO Space Centre, as the operational hub for the organization, has a responsibility to fuse information collected from the different national space operations centers across the Alliance and transform it into viable NATO products that support all operational processes and communities. Currently, products releasable to NATO originate

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18. NATO, "Multi-Domain Operations: Enabling NATO to Out-Pace and Out-Think Its Adversaries," NATO Allied Command Transformation (ACT) (website), July 29, 2022, https://www.act.nato.int/.

19. Arndt Freytag von Loringhoven, "A New Era for NATO Intelligence," NATO Review, October 29, 2019, https://www.nato.int/.

20. Christopher Stone, "Over-Classification in Space Programs Presents Too Great a Risk," Breaking Defense, September 2, 2021, https://breakingdefense.com/.

from a small number of Allies that have the capabilities to provide space intelligence, such as space-based missile warning systems.

For proper classification, national standard operating procedures must evolve to immediately consider sharing with the entire Alliance through a NATO-releasable product. A battle rhythm is required to share information regularly, and NATO will benefit from a concerted effort to improve space information sharing. No one nation has the sensor capacity to capture the entirety of space or Earth, however, the consolidation of space information across the Alliance can provide far more enhanced space domain awareness and other space support than currently exists in any one nation.

Ultimately, NATO faces challenges in how it collectively understands and operates as an alliance within space. As NATO aligns procedures across strategic commands to meet requirements, it must also educate new space specialists, coordinate with national initiatives, and share information in a fast-paced environment. Despite these challenges, multinational interoperability in space can be a force multiplier. As the ultimate multidomain enabler, greater interoperability in space has the potential to improve how the Alliance operates in other domains, thereby enhancing cooperative security.

Defense Planning

While resilience and survivability of Allies' space systems is a national respon-
sibility, NATO will consider ways to improve space resilience Alliance-wide,
including through sharing of best practices, and by exploiting force-multiplying
redundancies in space capabilities owned by Allies.

NATO Overarching Space Policy

One of the unique characteristics of NATO is how it plans for the defense of and fosters capability development for the Alliance through the NATO defense planning process (NDPP). The NDPP is used to align national defense planning activities with NATO priorities in providing multinational forces to meet "agreed targets" in the "most effective way."[21] The process allows NATO to take on a "full spectrum of missions" while limiting redundancy and harmonizing efforts across the Alliance without undue impact on national sovereignty.[22] It is the heartbeat of NATO.

As NATO does not aim to become an "autonomous space actor," it apportions requirements to member nations with existing space capabilities or the capability and willingness to develop them.[23] This planning design allows the Alliance to hold each Ally accountable for its requirements, link each Ally to collective defense, and help each Ally foster its national capability. In essence, NATO defense planning contributes to national capability development, limits unnecessary redundancy, and coordinates

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21. NATO, "NATO Defence Planning Process," NATO (website), updated March 31, 2022, https://www.nato.int/; and Alan Campbell, *Analytic Implications of the NATO Defence Planning Process*, SAS-081 Specialist Team Summary Report (The Hague, The Netherlands: NATO, April 2010): 9-4, https://apps.dtic.mil/.

22. Campbell, *Analytic Implications*, 9-4.

23. NATO, *Space Policy*.

requirements for the Alliance. For space specifically, NATO optimizes space support, contributes to national space efforts, and enables interoperability.

As a planning methodology for a large alliance, the NDPP is a political process separate from operational planning. The process is an iterative, quadrennial procedure that begins when the Allies issue the political guidance for the overall military aims and objectives of the Alliance, known as the Level of Ambition, which focuses on the medium term—approximately 7 to 19 years into the future.[24] The Level of Ambition is based on various factors including a range of threats, challenges, and opportunities for the Alliance.

The next political guidance, to be released in 2023, will set a tone for planning over the next four years and address NATO's ambition in light of current events in Ukraine. It will also be the first political guidance since NATO formally recognized space as an operational domain in December 2019. As such, it will have a significant influence on how NATO approaches space within defense planning.

Although the upcoming NATO defense planning process cycle is the first where space will be recognized as a separate domain, space requirements have been part of the NDPP since its inception. Several capabilities have been refined over multiple NDPP cycles and currently define space situational awareness; space-based atmospheric monitoring; space-based reconnaissance; positioning, navigation and timing; and satellite communication. For this cycle, the planning staff will integrate key aspects of the Overarching Space Policy into the NDPP.

Some of this integration will be relatively straightforward: the staff will refine existing requirements or they will add new ones to describe such things as the communications infrastructure necessary to share space domain awareness data to enhance "the Alliance's strategic anticipation and resilience."[25] Other integration efforts will be more difficult as the staffs seek to resolve the disconnect between a policy that calls for, among other things, "avoiding unnecessary duplication of effort" while simultaneously relying on the Allies for voluntary contributions to the domain.[26]

The NATO defense planning staffs face a unique challenge to further integrate space into the Alliance's decision-making processes and operations. One of the fundamental tenets of the space policy is that NATO does not intend to "become an autonomous space actor." This posture leaves capability acquisition to the member nations. This could hinder the inclusion of some command and control functions in NATO but also provides opportunities for interoperability by design or cooperative multinational solutions.[27]

Another dynamic to space can be challenging for defense planners. When capabilities are apportioned to the Allies as part of the NDPP, they are classified as quantitative

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24. NATO, "Defence Planning Process."

25. NATO, *Space Policy*.

26. NATO.

27. NATO News, "NATO and Luxembourg Boost Alliance Space Situational Awareness," NATO (website)," updated June 15, 2021, https://www.nato.int/.

or qualitative. Most capabilities are quantitative, such as airborne air surveillance or a heavy infantry brigade, which means the owner of that apportioned capability is accountable for providing it when called upon. To measure their effect, these types of capabilities are easier to quantify in terms of units, which is useful for apportioning them to the Allies.

Qualitative capabilities are more difficult to define, measure, or apportion properly, such as command and control or position, navigation, and timing. The inability to properly quantify space capabilities or effects is also a challenge for defense planners when it comes to scenario planning and building an effective multidomain force model commensurate with the Allies' Level of Ambition. Furthermore, while NATO's space policy states that all space assets will be provided to the Alliance voluntarily, all space capabilities currently fall into the qualitative category. A refined policy may be required to guarantee the Alliance has space resources available in anticipation of situations in which national and NATO mission priorities may not be aligned.

This policy may also need to address the proper coordination and deconfliction of services provided by multiple sources to align and reduce redundant efforts. As it stands, NATO's current role has the potential to hinder overall operational support. For example, when more than one NATO country has agreed to provide satellite communications, intelligence, surveillance, and reconnaissance services, or space situational awareness capabilities, NATO should be able to properly coordinate the required capabilities from the Allies according to demand. This requires a higher level of coordination with national operation centers to prioritize resources and deconflict coverage properly.

Despite these challenges in integrating space into defense plans, the NATO defense planning process contributes to space capability development and overall NATO resiliency. In the NDPP, after the capabilities are agreed upon, planners apply apportionment methodologies to ensure fair burden-sharing, and reasonable challenges are weighed appropriately for each Ally.[28] In the context of space capabilities, fair burden sharing and reasonable challenges mean that NATO cannot continue to rely on a single or few nations to provide a specific capability. This methodology, linked to the latest NATO strategic concepts and initiatives that focus on emerging technology development, can help distribute expertise and competitive advantage to more suppliers of space capabilities than NATO currently has.[29]

NATO's Allied Command Transformation has the expertise to encourage developments that meet NATO's military needs and comply with NATO policy. Allied Command Transformation works with the Allies to share developments and fund some of

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28. Campbell, *Analytic Implications*, 9-5.

29. "Emerging Disruptive Technologies," NATO (website), updated October 17, 2022, https://www.nato.int/; and NATO News, "NATO-Private Sector Dialogues Focus on NATO 2030 Initiative," NATO (website), updated June 2, 2021, https://www.nato.int/.

their research.[30] In the case of space, NATO military and legal professionals will ensure that all developments comply with the Overarching Space Policy, NATO's principle to act as a defensive alliance, and applicable international laws and treaties.[31]

Another way defense planners can seek to incorporate the policy into the NATO defense planning process is to integrate standards for interoperability into capability requirements. While operational planners write the standards, NATO defense planners can incorporate these standards into capability requirements themselves. This improves Allies' requirements over time and helps address the call to "improve space resilience Alliance-wide."[32]

In the long term, the defense planning staff must counter misconceptions about the space domain to encourage further integration of space into NATO defense planning. These misconceptions focus on the belief that space domain operations are always expensive and challenging. While not every nation will be able to fund relatively expensive or exquisite satellite constellations, there are plenty of other options for all Allies to participate in NATO's newest operational domain.

With the general decline of space technology costs, the Allies could contribute to NATO's space domain awareness through the procurement of low-cost sensors, services, and data from the commercial sector.[33] If NATO policy changes in the future, adopting quantitative space requirements through lower-cost capabilities could be accomplished without overly impacting the Allies' defense budgets. Overall apportionment is a zero-sum game, therefore, without a further increase in spending, the Alliance will have to decide which current requirements would need to be decreased or eliminated.

NATO defense planning is an uncommon process, one that aims to iteratively improve the collective security of the Alliance. Space presents a new challenge and opportunity for creative solutions in how to approach the development of capabilities fit for purpose. Furthermore, how NATO approaches its methodology for apportionment, scenario planning, and quantitative measurement of space capabilities will affect how capabilities are developed as an alliance and how successful the Alliance will be at maintaining a safe and secure domain.

Deterrence

Considering that Allies have recognised that space is essential to the Alliance's deterrence and defence, and to a coherent Alliance posture, the Alliance will consider a range of potential options, for Council approval, across the conflict spectrum to

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30. "Allied Command Transformation," NATO (website), updated September 23, 2021, https://www.nato.int/.

31. NATO, "NATO's New Space Policy Launches Activity for Allied Command Transformation," NATO ACT (website), updated February 8, 2022, https://act.nato.int/.

32. NATO, *Space Policy*.

33. Eric Tegler, "The Commercial Satellite Industry Is Increasing Awareness in Space But It's Not Changing Behavior Yet," *Forbes*, December 17, 2021, https://www.forbes.com/.

> *deter and defend against threats to or attacks on Allies' space systems, as appropriate and in line with the principles and tenets outlined in this policy.*
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> *NATO Overarching Space Policy*

Deterrence is at the heart of NATO's mission of collective defense. By incorporating space as one of its operational domains, NATO has considerably increased the complexity of its deterrence mission. But NATO's strength in deterrence lies not solely in its military ability to defend against a threat but also in denying the adversary any advantage of attacking in the first place. In this context, the collective space capabilities of the Allies contribute to NATO's deterrence strategy. Space certainly augments the Alliance's standing concept of deterrence, but the operationalization of space now adds a level of resiliency to NATO's mission. Furthermore, the space policy sets the stage for consultation and supports the concept of behavioral norms, which adds an additional layer of deterrence for the space domain and NATO.

Traditional Deterrence

NATO's traditional deterrence posture was the ability to present a force against which a rational adversary would be compelled to reconsider action as the cost of such an action would exceed the gain. At NATO's conception in 1949, US Senator Arthur Vandenberg hailed the Alliance as "the greatest war deterrent ever devised."[34] Drawing upon Article 51 of the United Nations Charter, NATO claims the right to collective self-defense.[35] In Article 5 of the North Atlantic Treaty, the Alliance declares its willingness to respond accordingly to "armed attacks" with the military might of all of the Allies if necessary to "restore and maintain the security of the North Atlantic area."[36] This is undoubtedly a formidable deterrent. This declaration has been tested over the past 73 years, but NATO has only invoked Article 5 once; in response to the September 11, 2001 terrorist attacks on the United States.

At the Brussels Summit in June 2021, NATO member state leaders declared that "attacks to, from, or within space . . . could lead to the invocation of Article 5."[37] This presents a level of complexity to NATO's deterrence posture as the definition of attacks may be left up to interpretation considering the myriad of kinetic, nonkinetic, and potentially reversible space threats that exist today. This addendum deserves much attention as NATO will need to consider strategic messaging and preconceived responses to attacks on critical national space assets that may lead to severe ramifications and possible escalation in a fragile domain. NATO did clarify the invocation would be considered "on a case-by-case basis."[38]

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34. Benn Steil, *The Marshall Plan: Dawn of the Cold War* (New York: Simon and Shuster, 2018), 319.
35. The North Atlantic Treaty, April 4, 1949, art. V, https://www.nato.int/.
36. North Atlantic Treaty, art. V.
37. NATO, *Brussels Summit Communiqué*.
38. NATO, *Space Policy*.

Deterrence by Denial

Space adds complexity to NATO's traditional posture. It also contributes to a deterrence-by-denial posture by adding a layer of resilience to NATO's defenses. The concept aims to deny the adversary any "confidence in attaining its objective."[39] While NATO may be highly capable of deterring an adversary from engaging in hostile behavior, deterrence by denial requires the development of specific capabilities to persuade an opponent that a particular attack on NATO's space assets would be too difficult or less fruitful.

Today, NATO maintains a strategy of deterrence and defense that draws on all the resources at its disposal to give the Alliance a wide variety of options for responding to threats from any direction. NATO's "Concept for the Deterrence and Defense of the Euro-Atlantic Area" has been characterized as a "reimagine[d] deterrence by denial" concept that does not rely entirely on the depth or weight of the Alliance's force employment but is intended to be more agile and robust.[40]

In *NATO 2030: Towards a New Strategic Concept and Beyond*, Kaitlyn Johnson articulates in the chapter "NATO in Space" how a deterrence-by-denial concept should apply to space. The concept includes a range of passive- and active-defense methods. The passive methods describe a division of labor among a proliferated and robust constellation, controlled by agile operators, that may be replenished as needed but where there is no single point of failure.[41]

This does not translate perfectly for NATO as it does not operate its own satellites, however, through defense planning and capability development, the Alliance can address technical interoperability standards for member states' satellites to incorporate robust hardware and software measures to shield or protect satellite sensors. NATO may also be able to address the management of requirements to disaggregate and distribute capabilities appropriately. Active defenses such as jamming, spoofing, dazzling, and lazing may provide effective deterrence, but their dual capability makes them politically challenging to adopt from a NATO perspective.[42]

Deterrence by denial can also be supported by the commercial space sector as it provides critical mission assurance and resiliency.[43] Another unique aspect of NATO membership is articulated in Article 3 of the North Atlantic Treaty. It calls on mem-

39. Michael J. Mazarr, "Understanding Deterrence," Perspectives (Santa Monica, CA: RAND Corporation, 2018), https://www.rand.org/.

40. Julian Lindley-French, "The NATO Strategic Integrated Operating Concept," Alphen Group (blog), October 16, 2020, https://thealphengroup.home.blog/.

41. Kaitlyn Johnson, "NATO in Space," in *NATO 2030: Towards a New Strategic Concept and Beyond*, ed. Jason Blessing, Katherine Kjellström Elgin, and Nele Marianne Ewers-Peters (Washington, DC: Foreign Policy Institute/Henry A. Kissinger Center for Global Affairs, Johns Hopkins University SAIS, 2021), 246–48, https://sais.jhu.edu/.

42. Johnson, "NATO in Space," 248–49.

43. John J. Klein, *The Influence of Commercial Space Capabilities on Deterrence* (Washington, DC: Center for a New American Security, March 25, 2019), https://www.cnas.org/.

bers to individually and collectively grow the capacity to defend against an armed attack.[44]

This capacity development relies on the interdependency between government and commercial sectors.[45] NATO's deterrence and defense task must consider the services of the commercial space industry. The growing commercial space industry provides options to NATO. Commercial open-source data, low-cost space launches, and other satellite services can help governments meet NATO requirements. The percentage of government- or military-owned satellites worldwide is smaller than commercially owned satellites, and that gap is increasing.

These commercial systems provide an additional layer of defense and deterrence that NATO needs to consider in application. For example, the commercial space industry provides resilience in its ability to improve communications, surveillance, launch, and space situational awareness. Commercial satellites provide a layer of resilience if another commercial or military satellite is damaged or degraded during a conflict. If satellite communications are jammed or damaged, a commercial service provider can route communications through its networks or potentially through the networks of another provider, also using different frequencies.

Commercially owned, proliferated Earth observation satellite constellations can also provide surveillance imagery that can augment or corroborate other sources. These commercial services have proven extremely effective in supplementing communications and providing valuable surveillance in the war in Ukraine.[46]

Responsive airborne launch is another example where commercial services can provide resilience to NATO. Should an asset be disabled or denied its utility, Allies should be able to rely on agile companies with a disaggregated global launch capability to rapidly respond to a critical gap in space.[47]

The commercial space sector can also play a part in deterrence by increasing space situational awareness and space forensics. Through its growing network of space situational awareness ground telescopes and other terrestrial tracking systems, the commercial industry may be able to assist in the attribution process following a hostile or criminal act in space.[48] Although the commercial space sector will not be considered to perform any active defensive or offensive action, commercial partners may be able to assist traditional military space systems in gathering information that may be used to identify those responsible and facilitate any subsequent response. These commer-

44. "Resilience, Civil Preparedness and Article 3," North Atlantic Treaty Organization (website), updated September 20, 2022, https://www.nato.int/.

45. "Resilience," NATO (website).

46. Beale, "Unseen Frontier."

47. Bret Perry and John Fuller, "Developing an Operational Framework to Enable Interoperable Allied NATO Responsive Space Activities" in *Air and Space Power Conference 2022: Enhancing NATO Air and Space Power in and Age of Global Competition*, 11–13 October 2022 Read Ahead (Kalkar, Germany: Joint Air Power Competence Center, June 2022), https://www.japcc.org/.

48. Theresa Hitchens, "China's SJ-21 'Tugs' Dead Satellite out of GEO Belt: Trackers," Breaking Defense, January 26, 2022, https://breakingdefense.com/.

cial capabilities are not accounted for in traditional defense planning, but NATO's ability to leverage the range of commercial space capabilities will dramatically improve its deterrence posture.

Responsible Space Behavior

Another aspect of deterrence is developing a shared understanding of concepts such as the role of space in a crisis or conflict or supporting international efforts to establish norms, rules, and principles of responsible space behaviors. One way to develop this shared understanding while maintaining the competitive advantage is through collective legal diplomacy. While NATO does not plan to change the international legal framework for space activities, it can serve as a venue for discussing and supporting norms to eliminate gaps in interpreting and implementing international law in space.[49]

An excellent example of collective legal diplomacy was the NATO-sponsored multiyear cybersecurity study that resulted in the internationally appreciated publication of the *Tallinn Manuals*, which includes the rules of international law governing cyber incidents that states encounter daily.[50] Other similar manuals or studies have been published specifically discussing military operations in space but were not associated with NATO.[51]

One of NATO's key roles is to serve "as a forum for political-military consultations," including "the development of legal and behavioral norms."[52] This applies to space and other arms control conventions and treaties. This is realized through NATO's Arms Control, Disarmament, and Weapons of Mass Destruction Non-Proliferation Centre that oversees different internal committees that address arms control and disarmament issues. The centre actively contributes to efforts among NATO's 30 members, its dozens of partners, and other countries to further international security obligations.[53] Space deserves the same level of attention afforded to arms control and weapons of mass destruction.

It is not the role of NATO to make international law; that legislation falls to nation-states. But while discussions continue globally that affect space security, NATO, as the world's largest political-military organization, should take the initiative to develop responsible military space behavior. This initiative will help shape an environment that is resilient in the face of actions that have the potential to invoke retaliation.[54]

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49. Karl-Heinz Brunner, *Space and Security – NATO's Role*: *Preliminary Draft Special Report* (Brussels, Belgium: Science and Technology Committee, NATO Parliamentary Assembly, 2021), https://www.nato-pa.int/.

50. Michael N. Schmitt, ed., *Tallinn Manual 2.0 on the International Law Applicable to Cyber Operations* (Cambridge, UK: Cambridge University Press, 2017), https://www.cambridge.org/.

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Conclusion

Space security is an international affair, and the framework for such achievement lies with NATO. Space security strategist James Clay Moltz once concluded "global institutionalism" is a less risky approach to achieving sustained security in space than any alternative.[55] Moltz argued unilateral "military-led security in space" as opposed to "transnational partnerships" may harm existing norms of behavior.[56] Moltz did not account for an intergovernmental, military-led alliance whose interest is security in space.

In any discussion of a global military space policy, NATO's Overarching Space Policy should be seriously considered. The policy is significant for a number of reasons. It outlines 30 countries' singular view of the importance of space and their collective approach to improving its security. Significantly, the policy itself highlights NATO's value as a dynamic alliance.

There are significant hurdles in their approach, such as overclassification, a lack of general knowledge of the domain, and an increasing requirement for trained and experienced personnel. Other issues require creative solutions such as capability development and proper accounting of space capability contributions from the Allies, as these pertain to defense planning. But NATO's organizational ability to improve interoperability, plan for its current and future defense, and build deterrence should be viewed as a model for collaboration and security, especially as it applies to space.

NATO will continue to adapt to emerging threats and disruptive technology. Future iterations of political guidance and strategic concepts will continue to drive how NATO approaches modern-day and future crises and will inevitably shape how the Alliance incorporates lessons learned into future capabilities and deterrence postures. Ultimately, current and future trends of space activity will demand measurable stability through international space collaboration, security efforts, and responsible space behavior, which NATO is in a unique position to influence. **Æ**

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55. James Clay Moltz, *The Politics of Space Security*, 3rd ed. (Stanford: Stanford University Press, 2019), 361–62.

56. Moltz, *Space Security,* 361–62.