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Space – Exploring NATO's Final Frontier

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ABSTRACT

Space is an increasingly important domain for the security and prosperity of the Transatlantic area. The 2022 NATO's Strategic Concept has recognised this reality, fully integrating Space into the alliance's posture. The use of Space has greatly enhanced the ability of NATO and its members to anticipate or respond to threats with greater speed, effectiveness and precision. However, Space is becoming an increasingly contested, congested and competitive domain. A multi-purpose use of Space, a growing number of actors and assets, as well as rapid advances in technology have created new opportunities – but also new risks, vulnerabilities and threats to allied security and defence. This requires NATO to reflect on how it could maintain its strategic edge in Space as in the other connected domains. Taking that into account, on 10–11 November 2022 the Allied Command Transformation (ACT) of the North Atlantic Treaty Organisation (NATO), the Istituto Affari Internazionali (IAI) and the University of Bologna held a high-level workshop exploring NATO's role in Space, whose main findings are summarised in this report.

keywords

Defence | NATO | Space | USA | China | Russia | EU | Technologies | Security

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Introduction

Space is an increasingly important domain for the security and prosperity of the Transatlantic area. The 2022 NATO's Strategic Concept has recognised this reality, fully integrating Space into the alliance's Deterrence and Defence posture. The use of Space has greatly enhanced the ability of NATO and its members to anticipate or respond to threats with greater speed, effectiveness and precision. However, Space is becoming an increasingly contested, congested and competitive environment. A multi-purpose use of Space, a growing number of actors and assets, as well as rapid advances in technology have created new opportunities – but also brought new risks, vulnerabilities and threats to allies' security and defence. This requires NATO to reflect on how it could maintain its strategic edge in Space as in the other connected domains.

Taking that into account, on 10–11 November 2022 the ACT, the IAI and the University of Bologna held a high- level workshop exploring NATO's role in Space. Academics, think tankers, officials and experts from the private sector contributed to the discussion, providing insights on the political, legal, economic, technological and military aspects of the use of Space. Key trends, dynamics and questions were identified. The results of this workshop will inform the 2023 edition of the NATO Academic Conference – the signature event of the partnership among ACT, IAI and the University of Bologna.

The workshop was opened by Vlasta Zekulic, Head of Strategic Issues and Engagement at ACT, Sonia Lucarelli, Professor of Pan-European Security at the University of Bologna, and Alessandro Marrone, Head of IAI's Defence Programme. The remainder of this report overviews key issues and observations

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This report summarises the main findings of a workshop organised on 10–11 November 2022 by the Allied Command Transformation (ACT) of the North Atlantic Treaty Organisation (NATO), the Istituto Affari Internazionali (IAI) and the University of Bologna.

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raised throughout the event's four thematic panels; the conclusion pinpoints key questions the Alliance should be able to address in order to preserve the security and prosperity of its members. Since the event was held under Chatham House rule, the names of contributing experts will not be revealed.

Panel 1 – Political and legal aspects

The panel began by discussing whether a power transition is taking place in outer Space. It was observed that China is playing a progressively more relevant role, while Russia has been trying to relaunch its Space Power. The US still retains the upper hand in terms of assets, capabilities and expertise helping NATO maintain its overall strategic edge, as well as to find a more defined role in the Space domain. This notwithstanding, the panel disagreed on the long-term implications of China's rise on the Space policies.

Some participants identified the rise of the Asian giant as a threat to US leadership and thus to allied security. First, the progressive build-up of Chinese hard capabilities might eventually downgrade the security of US and allied assets and activities, as in Space as on the ground. Second, Beijing is investing considerable resources in the construction of an image as a prestigious, responsible player also in the Space domain despite several shortcomings and examples of irresponsible behaviour. This might negatively affect the international negotiations in Space and NATO's internal cohesion, as well as Washington's ability to balance against China and Russia. Moreover, as US–China competition intensifies, some participants expect a trend of weaponisation of Space with many associated increasing risks and threats. Overall, this group of experts warned against wishful thinking and called on NATO to focus on Space deterrence – i.e., what measures could be employed to disincentive adversaries from using their own Space capabilities against the Alliance.

Other participants put forth a less pessimistic view, warning not to fall prey of self-fulfilling prophecies: under present conditions, they argued, there are no grounds to predict that war in Space is inevitable. On the contrary, NATO countries enjoy the opportunity to transform Space into an operational domain of fruitful international cooperation. In their view, China has so far abided by the playbook of Space power, without pursuing the goal of subverting the US leadership in Space. In turn, the US might want to reduce the risk of future conflict with China by recognising it as a major Space power and inviting Beijing to consider Space as an opportunity for cooperation – as it was eventually done during the Cold War with the Soviets. Of course, for this to happen, a minimal level of trust must be built between the two sides.

The panel agreed that European countries are playing an important, albeit secondary, role in such context. The European Union as an institution is in every aspect a Space power supporting the development of cutting-edge capabilities, while trying to achieve greater strategic autonomy. According to some participants,

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the EU has more recently integrated a purely commercial and economic-oriented approach to Space with a security and defence perspective. The Union has recognised Space as a critical domain and is in the process of connecting it with the wider EU political domain. Elements of such shift encompasses the creation of the Directorate General for Defence Industry and Space (DG DEFIS) and the EU Agency for the Space Programme (EUSPA). Moreover, by 2023 the European Commission and the European External Action Service (EEAS) are expected to release the first EU Space Strategy for Security and Defence, an evolution from merely having a presence in Space to secure the critical Space systems. However, participants noted several problems related to political and strategic concerns – for instance, the lack of willingness of different parties to share Space-related data and services with one another. This problem re-proposes itself outside of the EU, in US relations with European NATO allies. The panel agreed that, unless all parties decide to share a larger volume of more precise information on Space, the room for greater intra-EU and transatlantic synergies will remain limited – to the detriment of the West's ability to maintain its strategic edge.

The panel recognised that, due to the increasing relevance of Space as a domain of strategic competition, states should also pay greater attention to legal aspects at national and international level. Participants expressed different views regarding the degree of appropriateness of the legal framework that currently regulates Space activities. While some argued that existing norms are outdated, superficial and ultimately irrelevant in the face of power-dynamics, others highlighted their value as a tool for developing cooperative relations and a basis for expanding the governance framework further.

The panel observed that ongoing international discussions on the legal aspects of Space focus on four key issues: the need to update the Outer Space Treaty (OST) established in 1967; whether customary international law, international humanitarian law (IHL), the law of armed conflict (LOAC) apply to outer Space; how to increase the transparency of Space activities; and how to prevent an arms race in Space. So far, the fruitfulness of such discussions has been impaired by enduringly divergent interpretations of international principles, as well as incompatible interests between traditional and emerging Space actors. To the extent that the views upheld by the US, Russia and China (among others) remain largely incompatible, no legal progress is to be expected in the short-to-medium term besides soft law initiatives and diplomatic efforts to safeguard Space from anti-satellite (ASAT) testing. This relates to a moratorium to ASAT introduced by the US and supported by other nine states, recently winning with a large majority a vote in the UN General Assembly. Soft law has been the main instrument to update the Space legal regime since the end of the 1970s. In 2019, the UN Committee for the Peaceful Uses of Outer Space (COPUOS) approved by consensus the Long-Term Sustainability guidelines, a set of 21 non-binding norms negotiated over a decade. However, some participants highlighted how the 55-years old OST is still working fine as it is quite flexible and non- technological specific. Rather, with the appearance of many private firms, states remain the primary actors also from a legal perspective and national legislation acquires more importance.

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Panel 2 – Economic aspects

The panel discussed the evolving economic features of Space-related activities. According to some estimates, the global Space economy is worth 380 billion dollars and growing, while simultaneously experiencing a consistent privatisation. However, governmental funds and interests still back the majority of such commercial activities. Of the many sub-fields of the Space industry, two are most notable: satellite-related activities – a relatively mature, largely commercialised business, wherein governments still retain key stakes, due to relevance of satellites to national security; and in-Space activities – a less mature, government-driven sphere of business, mainly devoted to civilian applications. The panel's discussion mainly focussed on the former sub-field.

Today's satellite industry develops across four main sectors – namely the manufacturing, launch and operation of satellites, as well as a bunch of ground-based activities in support of satellites. The panel agreed that the sector is undergoing massive disruption, due to two interrelated factors: steadily low satellite launch costs and consistently expanding launch providers. This context will sustain technological development, the informatisation of society, as well as further efforts at Space exploration. However, outer Space will also become increasingly congested – to the detriment of the safety of everyone's Space activities.

The greater the number of actors and objects populating Space, the greater the need to coordinate its use. International organisations such as NATO, the EU and, ideally, the UN can provide the institutional umbrella under which to achieve such objective. Yet current coordination efforts are compromised by the overlapping mandates of existing national and international Space agencies, as well as governments' zero-sum logics. One of the risks associated with an enduringly unruly outer Space regards the collision of Space objects – which can cause enormous economic damage – both direct and indirect – to human activities as in Space, as on Earth. Hence, panellists noted that a logic of mutual regard and sustainability should be applied in managing the Space environment, recognising the intrinsic economic and political value of Space.

Participants convened that the expansion of the Space economy also creates risks for national security. Two main conditions are worth observing. First, the more technological development enables Space activities, and the more states benefit from them – the more everyday processes and critical infrastructures become dependent on Space and thus exposed to risks emanating from there. A case in point is that of the Global Navigation Satellite Systems (GNSS, such as GPS or Galileo), whose hypothetical disruption would nearly paralyse economies across the world. Second, and related, the sheer proliferation of orbiting objects and Space actors multiplies the number of potential targets and hostile subjects, as well as the chances to suffer damage in, to or from Space. Moreover, participants underlined the dynamism of China and Russia in the global Space business,

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with many transaction targeting Space companies potentially leading to hostile takeovers and acquisition of sensitive technology and data. Simultaneously, complicit a still limited ability to gather information about what happens in Space – Space Situational Awareness (SSA) – the attribution of responsibilities becomes more difficult. These conditions impose the need to better secure Space-based and Space-related infrastructure (e.g., creating redundancies, strengthening means to collect coherent information), as well as establishing a clearer set of rules and procedures that strengthen accountability in Space. The war in Ukraine demonstrated the importance of commercial assets as well as the willingness to make them target of attacks and retaliation.

Panel 3 – Technological aspects

The panel reflected on the technological underpinnings, implications and risks related to Space activities. First, participants discussed counterspace capabilities, noting that across the globe a significant share of research and development (R&D) funding and testing goes into their development. Kinetic and non-kinetic ASAT capabilities are being devoted particular attention, especially by US competitors like Russia and China – who see such capabilities as key in the event of direct confrontation with Washington and/or NATO. Not only Moscow and Beijing are the Space actors conducting the latest most destructive ASAT tests, but also, and relatedly, those whose relative increase in counterspace capabilities is the most evident. These developments pose a threat to transatlantic security.

Second, the panel convened that, in principle, technological advances will enable greater SDA and should reinforce the transparency of Space activities. However, several obstacles lie on the way. To begin with, the growing number and diversity of Space actors and existing on-orbit objects complicates the gathering and assessment of information (see also Panel 2). Moreover, the dual nature of many Space installations diminishes the transparency and predictability of the Space environment, since it blurs the line of what shall be considered a likely (let alone legitimate) target of hostile Space activities. Also, not all actors enjoy the same degree of SDA: as different states have different capabilities and willingness to share the data they possess, considerable confusion arises about the position, nature and trajectory of Space objects. Not only this condition hinders cooperation in Space, but also sustains a higher risk of (unintended) collisions and reinforces the negative trend already determined by the growing accessibility and, therefore, congestion of Space. Furthermore, a strengthened awareness capability would better inform on co-orbital threats and purposes of in-orbit servicing, an evolving technology with many promising but intrinsically dual uses.

Relatedly, the panel discussed the problem of Space debris – which are being produced in increasingly larger amounts by kinetic ASAT tests, the malfunctioning or breaking up of Space installations, as well as their collision. Debris pollution creates risks not only to in-Space activities but also to Space-dependant infrastructures on Earth, and impedes the safe access of outer Space. Moreover,

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according to participants, we are more and more incurring in the issue of uncontrolled re-entry of debris from Space, which might cause physical damage to earthly activities.

New technologies can help limit these problems. The panel suggested that the further development of de-orbiting capabilities should be encouraged – or even made a requirement for accessing Space. Artificial Intelligence (AI) applications can help tackle the urgent task of freeing up Space from debris, to begin with the identification of their exact location and trajectories. Participants also stressed the importance of multiplying the number of observation points of Space activities, to obtain as much of a complete and continuous supervision as possible. Information collected from these (ideally interconnected) data collection facilities should then be shared in a global repository and used to strengthen scientific enquiry as well as sound fact-based political solutions.

Panel 4 – Military aspects and warfare

The panel discussed the implications for defence of the increasing risks and threats to the security of outer Space. Participants noted that different states might hold different priorities when it comes to Space-related security, in accordance with their own political ambitions, strategic interests and military capabilities. While there exists a minimum set of military capabilities that allows a state to become a player in the Space domain (e.g., from the traditional GNSS, satellite communications and Earth observation to SSA capabilities), more advanced Space actors have developed very different toolkits (e.g., Russia considerably invests in counterspace capabilities). Participants also restated the security implications of the commercialisation of Space, and noted the mostly indirect, non-kinetic nature of prevalent offensive Space technologies, such as cyber-attacks, electronic warfare (EW) and direct energy (DE). Some participants highlighted the lowering barriers to bring a credible threat to Space systems, also by non-Space actors, and the growing necessity to conceive the Space and cyber domains together considering, in particular, that while NATO has no Space capabilities on its own, it does have ground stations – seen among the most vulnerable targets.

The panel then focussed on the (prospective) role of NATO in the Space domain. Operating in Space is both old and new to NATO: on the one hand, Allies have had Space capabilities since the 1960s; on the other hand, recent technological and political developments have given Space greater importance than ever, generating new risks and opportunities. NATO has included Space into its decision making and operations planning processes and is setting up the necessary institutional framework to receive support from allied Space assets and disseminate relevant knowledge across its members as required. However, the full realisation of NATO's Space potential is hindered by two interrelated problems. First, NATO as an institution is still not producing in-depth and fully informed analyses and forecasts of Space as an operating environment. Second, and related, the sharing of Space-relevant knowledge and information across Allies is limited.

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As in other domains, NATO's ability to operate in Space depends on the capabilities made available by individual allies. As part of the ongoing effort to strengthen allied defence and deterrence posture, NATO is trying to create the conditions for diversifying the Space capabilities of its members and become more resilient, also by relying more on private-public joint ventures. Moreover, while not a party to any Space treaties, NATO wields the institutional power to harmonise the perspectives of its members on Space governance. A key transversal issue on which the panel drew attention regards the activation thresholds of article 5 of the North Atlantic Treaty in Space. Participants eventually converged on the strategic wisdom behind NATO's deliberate vagueness as to when to activate article 5 in the Space domain. While some argued that the absence of pre-determined thresholds hinders the Alliance's ability to respond promptly to threats (as in Space as elsewhere), to the detriment of its deterrence posture, others maintained that deterrence was better served by the effective communication of the allies' unity of intent, irrespective of case-specific thresholds, to complicate the strategic calculus of adversaries.

Finally, participants noted how NATO could play a critical role to identify technological dependencies in Space, determining how much the Alliance is dependent for specific technologies or capabilities. Therefore, it would be beneficial to elaborate an industry Space partnership in this perspective.

Conclusion

The expert workshop "Space – Exploring NATO's Final Frontier" gave rise to insightful debates on the political, legal, economic, technological and military aspects of human activities related to Space. Participants outlined ongoing trends and their relevance to NATO. They pointed to the increasing importance of Space to global competition and expressed their views on the contradictions residing in the international landscape regulating Space activities. The panels discussed also the opportunities and risks behind a rapidly growing Space economy and its technological underpinnings. Finally, the military implications of a growingly congested and contested outer Space were analysed.

As a result of this two-day workshop, participants were able to identify a set of key questions that NATO should be able to address, in order to preserve the security and prosperity of its members. Some of the questions identified are as follows:

- What is NATO's interest in Space?
- Who is the biggest competitor of the in Space: Russia or China? What are the specifics of their power in Space?
- How can NATO exploit the interconnectedness of the global environment to acquire leverage on its competitors in Space?
- How can NATO ensure the necessary funds and expertise to implement its Space policy?
- How do gaps in Space capability across allies affect NATO's security?
- How can NATO facilitate the harmonisation of views and policies across its members?

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- What can NATO do to enhance the interoperability and standardisation of allied Space capabilities?
- How can NATO contribute to shaping the governance on the use of Space?
- How can NATO contribute to socialising new Space actors into best practices and rules of cooperative behaviour?
- How can the US and NATO incentivise Russia and China to cooperate in Space?
- Which practical rules of behaviour in Space could be agreed upon – within and outside NATO?
- Can the legal frameworks applying to the seas, the Arctic and cyberspace somehow help develop Space legislation?
- How can NATO best rely on private firms to strengthen allied security?
- What are the main challenges for commercial firms to support the security of Space communications?
- How can NATO contribute to limiting the political tensions arising from economic competition in Space?
- How can NATO contribute to limiting the arms race in Space?
- How can NATO support the sustainability of Space operations?
- How can NATO fully exploit the services from Space in security-related activities, from the security implications of climate change to emerging threats?
- How to ensure higher levels of training, joint exercises and focus on human capital and what could be the role of NATO Space CoE in this endeavour?

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