

NATO SPACE AND THE WAY AHEAD

A NATO SPACE COE MISSION



by Colonel (Res.) Jerome Dufour
French Air and Space Force
Command Group Support
NATO Space Centre of Excellence

And

Lieutenant Colonel Stavros Karypidis
Hellenic Air Force
Deputy Division Head for Education and
Training
NATO Space Centre of Excellence

Back in July 2018, at the Brussels Summit, NATO recognised that Space is a 'highly dynamic and evolving area, which is essential to a coherent Alliance deterrence and defence posture'. Thus, the Alliance decided to develop the NATO Overarching Space Policy [1], which was adopted in June 2019.

Since then, NATO has officially recognised the Space Domain as crucial for global stability, aiming to foster responsible behaviour and cooperation among the Nations to ensure a peaceful and secure, unhindered use of Outer Space for the Alliance. The organisation is committed to promoting the safety, security, and resilience of its members' space assets [1]. Space is indispensable for the Alliance's deterrence and defence, serving as an essential infrastructure not only for militaries, but also for the global economy. The unrestricted availability of various types of space systems and their related products is fundamental for societies, their security, and their futures.



In 2021, France proposed the creation of a NATO Centre of Excellence (COE) dedicated to Space, capitalising on the proven institutional framework of existing COEs. Today, 30 COEs – located in various NATO countries – work on different focus areas and provide crucial expertise and workforce to NATO and its Nations [2]. The new NATO Space COE, located in Toulouse, in the south of France, was formally established on 18 January 2023, with the signature of the Operational Memorandum of Understanding by its 15 founding Nations, and received its NATO accreditation a few months later, on 14 July, during the NATO Summit in Vilnius



Since then, the Centre has been actively working to expand its capabilities and grow its staff, supported by its 15 sponsoring Nations. The NATO Space COE works to support the Alliance's evolution in the Space Domain, providing expertise, support, and products to various national and NATO space-related efforts by operating across the four pillars common to all COEs: Concept Development and Experimentation, Doctrine and Standardization, Education and Training, and Analysis and Lessons Learned.

In essence, the NATO Space COE serves as a knowledge hub for NATO Space, bringing together individuals and their insights to support effective analysis, concept development and experimentation, while promoting common approaches among stakeholders. This collaborative effort aims to achieve improved Allied cohesion and interoperability when facing current and future challenges in the Space Domain – the ultimate high ground when conducting Multi-Domain Operations (MDO).

In addition, the NATO Space COE undertakes various key roles in the context of NATO Space. Specifically, it serves as the Department Head for the Space discipline. In this capacity, it is officially responsible for ensuring that the education and training requirements pertaining to Space find adequate solutions. This includes identifying applicable existing solutions, tailoring them as needed to fulfil NATO Space requirements, or developing new curricula or courses where gaps are identified. Furthermore, the NATO Space COE holds the custodianship for the development of the forthcoming doctrine for NATO Space Operations, and provides dedicated support to major NATO exercises by fulfilling the role of Opposing Force (OPFOR) within the Space Domain.



SPACE AS A MILITARY DOMAIN

NATO’s overarching Space Policy establishes key points based on a set of principles and tenets that align with the Alliance’s overall strategic posture. Free access to, and free use of, Outer Space for peaceful purposes serve the common interest of all nations. Space capabilities complement the NATO deterrence and defence posture, based on an appropriate mix of capabilities. For that purpose, NATO has been asked to accelerate the integration of Space into all Allied planning, exercises, and possible MDO efforts [3].

In the Space Domain, nations are responsible for procuring and maintaining their capabilities and resources, including military assets. In contrast, NATO, as a transnational military Alliance, does not own space systems but assumes a coordinating role. In this context, NATO facilitates the sharing of information on threats, challenges, vulnerabilities, and opportunities, and works to enhance interoperability between Allies’ space data, products and services (DPS), thereby increasing their overall collective operational effectiveness.



To achieve a unified Alliance posture for deterrence, defence, and resilience, Allies have developed a shared understanding of Space as an operational domain. Ensuring resilience in the Space Domain is critical to maintaining operational continuity, particularly when access to space-based services is degraded, denied, or disrupted. To address these challenges and sustain operational effectiveness, NATO must leverage cooperation with the space industry and the commercial sector. Such partnerships can drive the development and integration of autonomous networks and smart, collaborative technologies, enhancing the Alliance’s ability to operate effectively under contested conditions.

The Space Domain is an integral part of the military Instrument of National Power, designed to provide governments with options for achieving strategic outcomes. The ability to operate together, collaboratively and in real-time, is crucial for mission success.

Space supports military operations through the provision of several critical capabilities:

- **Space Situational Awareness (SSA)** to understand the space operational environment – a prerequisite to identifying risks and threats in Space, from Space, and to Space, as well as to conducting operations in Space;
- **Space-based Intelligence, Surveillance and Reconnaissance (SBISR)**– for the conduct of strategic, operational and tactical assessments, to improve situational awareness, and to support decision-making and planning;
- **Satellite Communications (SATCOM)** – essential for supporting operations in all domains and enabling effective command and control over wide Joint Operations Areas;
- **Positioning, Navigation and Timing (PNT)** – to enable precise positioning and synchronisation across the full spectrum of military operations;
- **Meteorology and Oceanography (METOC)** – to provide accurate weather, ocean, and space weather data that enable safe, effective planning and execution of military operations.
- **Shared Early Warning** – contributing to deterrence and defence by providing persistent monitoring and early warning of events (e.g. missile launches).

Effectiveness in the Space Domain will depend on the adaptability of space capabilities and technologies, enabling their use in a wide range of missions and military efforts. For example, communications and connectivity require the ability to utilise multiple spectrum frequencies, large bandwidths, low latencies, and dynamic communication channels.

Today’s conflicts are complex, and demand operations integrated across various domains. Technology is inextricably linked with military power. Technological innovations can provide new strategic options and are key to building and maintaining credible space capabilities. As potential adversaries continue to enhance their counter-space capabilities, it is essential not to underestimate them. Strengthening national and Allied cooperation is therefore essential to ensure that Space remains secure and accessible for everyone.

SPACE DOCTRINE

The NATO Space COE is fully engaged in supporting the Alliance as it faces the challenges of the evolving Space Domain. As previously stated, NATO has acknowledged both the increasing dependence of its military operations on space-based capabilities and the strategic implications of operating in Space as a contested domain.

As a core activity, the NATO Space COE supports the development of space-related doctrine and standards within the Alliance, with the aim of integrating space concepts and technologies. Doctrine enables interoperability, and NATO considers doctrine for space operations to be an integral part of its broader effort to adapt to the changing security environment and develop an MDO-ready Alliance by 2030. This adaptation includes addressing emerging threats in the Space Domain and ensuring the successful integration of Space as a key enabler of multi-domain operations.

The development of the first NATO doctrine dedicated entirely to space operations – which will be published as Allied Joint Publication (AJP) 3.29 – started in late 2023. In a publication planned to be finalised by 2026, this operational-level doctrine aims to cover the following aspects: fundamental terms and definitions; organisational structures; the “how to” of allied planning and conducting of operations in the Space Domain; and the firm nesting of NATO Space activities into multi-domain operations.



To coordinate the development process, the Alliance asked the NATO Space COE to be the “custodian” of this completely new doctrine. This role involves bringing together relevant stakeholders from NATO and its Allied Nations to draft the doctrine through several stages until it is sufficiently mature for its endorsement and integration into NATO’s doctrinal architecture, and thus for application by NATO forces throughout the continuum of competition. Once finalised, NATO’s doctrine for Space Operations will serve as a guiding framework for the development of capabilities, providing a yardstick for structural updates, operational directives and space-related procedures.

As use of the space environment continues to evolve, NATO doctrine will adapt to ensure that it remains effective and relevant. It will also inform NATO’s exercise, training, and education initiatives, ensuring that NATO forces are equipped to operate effectively in the Space Domain; it will, in turn, be informed by lessons learned from such training and exercise activities. [4].

NATO EXERCISES AND THE ROLE OF OPFOR SPACE

The NATO Space COE directly supports major NATO exercises, chiefly in command post exercises (CPX) – an exercise format with a focus on decision-making processes and the evaluation of response options without deploying troops into the field. In this context, the Centre contributes by fulfilling the role of Opposing Forces (OPFOR) Space in scenarios designed for MDO, mainly in the STEADFAST series of exercises, held annually at the Joint Warfare Centre in Stavanger (Norway). This provision of space expertise through training has enhanced the capability of Allied Nations to operate effectively in the Space Domain and defend against potential threats and crises. NATO exercises are essential for the Allies’ ability to develop practical knowledge on how to achieve strategic objectives, enhance interoperability, address emerging challenges, support the integration of the Space Domain in military operations, and contribute to the continuous improvement of NATO doctrines and capabilities.



Education and Training

The NATO Space COE Education and Training Division collaborates with relevant NATO stakeholders to create, orchestrate and incorporate into exercises realistic scenarios and emerging challenges related to space operations. Exercises are designed to align with NATO’s strategic objectives, including enhancing resilience, improving deterrence and defence capabilities, and promoting responsible behaviour in Outer Space.

OPFOR Space is part of an exercise concept that simulates a hostile force threatening, among others, space assets owned by Allied Nations, or challenging NATO’s free use of Space. This approach helps NATO Nations to understand and prepare for potential threats, such as direct anti-satellite weapons (ASATs), electronic warfare (EW) attacks targeting satellites, attacks against ground stations or satellite communication networks, orbital debris, and other space hazards.



OPFOR Space contribution to NATO exercises aims to achieve several key objectives, including:

- Testing NATO Space Situational Awareness capabilities and improving data sharing among Allied Nations.
- Practising defensive space operations and countering potential space threats that target national space systems.
- Building partnerships with international organisations, industry, academia, and other stakeholders to enhance NATO’s capabilities and promote responsible behaviour in the Space Domain.
- Enhancing the resilience of NATO’s access to space services through contingency planning, redundancy, and alternative communication methods.
- Testing the provision of space DPS to the Alliance.

OPFOR Space covers a wide range of scenarios in NATO exercises. These scenarios range from direct targeting of Allied Nations’ satellite capabilities to hybrid threats aimed at undermining confidence in the space capabilities used by the Alliance. It is important to note that the Space Domain has strong interdependencies with the other domains, making it crucial for today’s operations, in which intelligence, navigation, positioning, and communication are essential.

Lessons learned from exercises provide valuable resources that feed the NATO Space COE’s knowledge development process. After each exercise, participants share lessons learned and best practices in order to improve NATO space doctrine, policies, and procedures. As such, exercise outcomes inform the development of capabilities and training programmes, as well as educational materials tailored to the enhancement of NATO’s effectiveness in the Space Domain.

CONCLUSION



NATO views peace and security in the Space Domain as a critical component of global stability and recognises maintenance of this status as a shared responsibility for all actors in Space. Therefore, the organisation remains committed to promoting the safety, security, and resilience of its Allies’ space assets through various initiatives and partnerships.

Since 2019, NATO has significantly developed its approach to Space, including the acknowledgement of Space as a fifth operational domain. Now, the collective effort of the Alliance to live up to its level of ambition finds strong support from the NATO Space COE, which is committed to preparing NATO Space for the challenges of the future.

One of the key tasks of the NATO Space COE is to support the development of the first NATO doctrine for Space Operations. As its custodian, the NATO Space COE coordinates contributions from a team of stakeholders across national and NATO entities.

In addition, the NATO Space COE plays a pivotal role in supporting exercises, with an emphasis on the OPFOR Space role, which is essential for establishing the Space Domain as a foundational part of MDO. The NATO Space COE’s involvement in exercises aims to support the use and development of space capabilities, promote responsible behaviour in Outer Space, and train current and future leaders and their troops to support the creation and maintenance of MDO-ready NATO forces. These exercises not only develop practical skills but also contribute to the implementation of NATO standards, as well as addressing current and future threats and vulnerabilities.

As the importance of Space continues to grow, the NATO Space COE remains committed to supporting the Alliance in adapting and implementing its strategies, doctrine, and capabilities, both nation- and commercially-provided to address new challenges. By fostering collaboration with standardised procedures and continuously helping to improve capabilities, the NATO Space COE aims to ensure that the Alliance is ready to address any new potential threat that might emerge in the rapidly evolving and increasingly contested Space Domain.

THE NATO SPACE COE SPECIFICATIONS

The NATO Space Centre of Excellence (COE), officially accredited on 14 July 2023, and based in Toulouse in the south of France, is actively working to improve the Alliance's expertise in the Space Domain, providing knowledge, analysis, and products across various operational functions such as Space Domain Awareness, Operational Space Support, and Space Domain Coordination.

NATO Space COE has four divisions :

- **Concept Development and Experimentation Division (CD&E)** monitors space trends and examines future space concepts and capabilities that could be of interest to NATO and its Partners. CD&E is actively engaged in technical exercises, supporting wargaming and the testing and evaluation of concepts through experimentation.
- **Doctrine and Standardization Division (D&S)** is responsible for creating the doctrinal framework for Space and support standardization in the space domain.
- **Education and Training Division (E&T)** supports the evolution of individual and collective training solutions to develop Space expertise within the Alliance.
- **Analysis and Lessons Learned (A&LL)**, aims to obtain and apply learnings to optimise the outputs provided by the other three divisions and by the NATO Space COE in general, as well as support NATO with analysis regarding operational use of Space.



Endnotes

[1] NATO's overarching Space Policy, https://www.nato.int/cps/en/natohq/official_texts_190862.htm

[2] [NATO-Accredited Centres of Excellence Catalogue 2025](#)

[3] Washington Summit Declaration, [NATO - Official text: Washington Summit Declaration issued by NATO Heads of State and Government \(2024\), 10-Jul.-2024](#)

PHOTOS CAPTION

- 1/ By NATO Space COE: the fifteen NATO Space COE sponsor nations signed the Memorandum of Understanding
- 2/ By NATO Space COE: the participation to the 39th US Space Symposium in Colorado Springs, USA
- 3/ By NATO Space COE: the support to AsterX 2024 exercise of French Space Command in Toulouse, France
- 4/ By NATO Space COE: the development of doctrine and standards as part of the NATO Space COE activity
- 5/ By NATO Space COE: the support within major NATO exercises as Opposing Force (OPFOR)
- 6/ By NATO Space COE: the continuous improvement of processes through analysis and lessons learned
- 7/ By NATO Space COE: the NATO headquarters in Brussels, Belgium
- 8/ By NATO Space COE: the NATO Space COE Director was the Master of Ceremony at the first NATO Space Symposium