



European Space Policy Institute



**Executive
Summary**

Europe, Space and Defence

From “Space for Defence” to
“Defence of Space”

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A CHANGING INTERNATIONAL AND OPERATIONAL CONTEXT

Space applications, including remote sensing, signal intelligence, telecommunications and positioning/navigation, have become central to the conduct of military operations, in particular since the First Gulf War. As a consequence of the growing dependence of states on space capabilities for security and defence purposes, satellites have become strategic targets for a range of actors with various motivations and objectives.

Over the last decades, threats to the safety and security of the space infrastructure have multiplied, diversified and intensified. Beyond safety issues related to an ever more congested space environment, space systems may also become the target of deliberate attacks to physically harm the system, to permanently degrade or temporarily disrupt its capabilities or to intercept confidential information. Military satellites are not the only ones to be affected by these developments as the relationship between civil and military domains tends to blur: dual-use assets and hosted payloads have become common place, and military forces increasingly rely on commercial space services.

	Physical destruction	Degradation, interruption	Denial, disruption, interference	Interception
Kinetic weapons (e.g. ASAT missile)	Yes	Yes	No	No
Directed-energy weapons (e.g. blinding lasers)	No	Yes	Yes	No
Electronic warfare (e.g. jamming, spoofing)	No	No	Yes	No
Cyber attacks (e.g. system compromise)	Possible	Possible	Possible	Possible

Intentional man-made threats constituting a danger for space assets

These developments take place in a changing international and geopolitical environment marked by rising tensions and changes in the global balance of power. In this context, the potential vulnerability of space systems has become a major concern, leading governments to reconsider their doctrines and to adopt more assertive postures in the space domain. More specifically, several space powers are:

- **... starting to address space as an operational warfighting domain alongside land, air and sea:** Many nations are now seeking to improve and demonstrate their capacity and readiness to treat outer space as a theatre of military operations. As a consequence, space increasingly appears as a field of rivalry that could become an arena of conflict.
- **... reorganising their armed forces to better address and integrate the space domain:** Overall, it is the whole spectrum of space defence activities, from research, development and acquisition to operation and command that is concerned, following new national doctrines and objectives.
- **... developing offensive and defensive capabilities as part of space security and deterrence strategies:** Major space powers are advancing technologies to disrupt space systems (e.g. kinetic or energy weapons, RPO, electronic and cyber) but also exploring new approaches to reinforce the resilience of their critical space infrastructure (e.g. distributed architectures, responsive capabilities).

The following table provides an overview of major developments on the international scene over the past 15 years.

	Strategic evolution	Organisational evolution within the military	Capabilities development and major events
China	<ul style="list-style-type: none"> • Recognition of space as a military domain • The defence of space assets has become legally binding 	<ul style="list-style-type: none"> • Creation of the Strategic Support Force (PLASSF) to deal with cyber, space and electronic warfare issues • Establishment of a Space Systems Department within the PLASSF 	<ul style="list-style-type: none"> • Test of an ASAT missile in 2007 and other tests in the following years • Likely test of a laser in 2006 to blind a U.S. satellite • Several RPO experiments between 2010 and 2016
India	<ul style="list-style-type: none"> • Late use of space for military purposes • Publication of the "Defence Space Vision 2020", calling for more dual-use assets and the development of dedicated military satellites • Work on ASAT technologies to improve its deterrence capacities 	<ul style="list-style-type: none"> • Creation of an Integrated Space Cell within the HQ of the Integrated Defence Staff • Creation of a Defence Space Agency • Reflections on a future Space Command 	<ul style="list-style-type: none"> • Test of an ASAT missile in March 2019
Japan	<ul style="list-style-type: none"> • Had long defined "peaceful purposes" of space as "non-military" • Gradual change to enable armed forces to use space data • The last Basic Space Law paves the way to a greater use of space for military purposes 	<ul style="list-style-type: none"> • In 2022, 100 people will be assigned to the Space Domain Mission Unit, which performs SSA missions (for instance to collect intelligence on foreign capabilities) and conduct satellite-based navigation and communications. A preliminary version will be set up in 2020. 	<ul style="list-style-type: none"> • Not declared
Russia	<ul style="list-style-type: none"> • Militarisation of outer space recognised as a main external military danger • Recognition of the need to exploit the overreliance of other countries on space in case of conflict 	<ul style="list-style-type: none"> • Creation of the Aerospace Forces through the merging of the Air Force and the Aerospace Defense Troops 	<ul style="list-style-type: none"> • At least six tests of Nudol, an anti-satellite missile, between 2015 and 2018 (according to U.S. sources) • Deployment of the Peresvet laser cannon in military forces from the end of 2018 • Close approaches to the French-Italian satellite Athena-Fidus
United States	<ul style="list-style-type: none"> • Space is considered as a vital interest • Space dominance doctrine at the beginning of the 2000s, then "softened" in space control • Return of a more assertive stance by recognising space as a warfighting field, like land, air and sea • Development of a new defence space strategy 	<ul style="list-style-type: none"> • Reactivation of the U.S. Space Command in August 2019 • Creation of the Space Development Agency • Creation of the Space Force in December 2019 • Willingness to form coalitions to activate if a conflict occurs in space • Development of initiatives to promote international cooperation in space operations (Olympic Defender, CSpO, Schriever Wargames...) 	<ul style="list-style-type: none"> • Test of an ASAT missile in 2008 (among previous other tests) • Reflections on space-to-space weapons • Several test campaigns of the X37-B, a classified space plane programme

Evolution of the postures of major non-European space powers

Today, many spacefaring nations, including European countries, share serious concerns over the weaponisation of the space domain and seek to better defend their space systems against potential hostile acts. Space defence is poised to become a prominent issue on the international scene as addressing emerging threats will likely involve, in addition to advancing technologies and operational capabilities, the elaboration of political alliances, or attempts to agree internationally on some "rules of the game" for space operations.

Ultimately, the growing significance of "Space for Defence" is creating a need for the "Defence of Space":

Space for Defence

- Encompasses the various uses of space capabilities for military operations and missile defence (early warning) → often called "space support to operations"
- Accounts for the main functions of interest to the military: intelligence, surveillance and reconnaissance (which includes Earth observation, signal intelligence, early warning and meteorology); satellite communications; positioning, navigation and timing; space surveillance

Defence of Space

- Accounts for the fight against potential threats against space assets (kinetic, directed-energy, jamming, spoofing, cyber) and existing countermeasures
- Includes defence of the space-based, ground-based, down- and uplink segments when the asset is in operation
- Ensures protection of the service and/or the system
- Underlines the importance of space surveillance through space situational awareness

The two dimensions of Space Defence

The changing international and operational context inevitably raises the question of the posture to be adopted by Europe in the space defence domain.

SPACE DEFENCE IN EUROPE

Space defence, a national domain

Individual states remain the core actors in the domain of space defence. Military strategies are defined at national level, and the development and operation of space military assets are managed by national organisations.

Today, most European states acknowledge space as a strategic domain, alongside land, sea, air and, increasingly, cyber, but they have adopted different policies and doctrines according to their sensitivities, priorities and concerns. European states also have different governance structures with major differences on the distribution of roles and responsibilities, including those granted to space agencies and private actors. Only a few countries adopted full-fledged space defence strategies and possess advanced capabilities addressing a broad spectrum of defence-related space applications.

	National strategies and policies addressing space defence	Key space military programmes (current and planned)
France	<ul style="list-style-type: none"> White Paper (2008) French Space Strategy (2012) White Paper (2013) Strategic Review (2017) 	<ul style="list-style-type: none"> Earth observation: CSO; Helios 2 & Pleiades (leader) Signal intelligence: ELISA; CERES Communications: Syracuse 3 & 4; Athena-Fidus & Sicral 2 (with Italy) Surveillance: GRAVES; SATAM
Germany	<ul style="list-style-type: none"> Space Strategy of the German Federal Government (2010) White Paper on Security Policy and the Future of the Bundeswehr (2016) Strategic Guidelines for Space (2017) Conception of the Bundeswehr (2018) 	<ul style="list-style-type: none"> Earth observation: SAR-Lupe; SARah; Georg Communications: SATCOMBw; Heinrich-Hertz Surveillance: TIRA; GESTRA
Italy	<ul style="list-style-type: none"> White Paper for International Security and Defence (2015) National Security Strategy for Space (2019) 	<ul style="list-style-type: none"> Earth observation: COSMO-SkyMed; OPTSAT-3000; CSG; Helios 2 (cooperation) Communications: Sicral 1; Sicral 2 & Athena-Fidus (with France) Surveillance: national sensors
Spain	<ul style="list-style-type: none"> National Security Strategy (2013) National Security Law (2015) Master Plan for Space Systems (2015) 	<ul style="list-style-type: none"> Earth observation: PAZ; Ingenio; Helios 2 & Pleiades (cooperation) Communications: Hispasat-1D; Spainsat; XTAR-EUR; SpainSAT-NG Surveillance: national sensors
United Kingdom	<ul style="list-style-type: none"> National Space Security Policy (2014) National Space Policy (2015) Strategic Defence and Security Review (2015) Joint Doctrine Publication on UK Air and Space Power (2017) Mobilising, Modernising & Transforming Defence (2018) 	<ul style="list-style-type: none"> Earth observation: Carbonite 2 Communications: Skynet 4, 5 & 6 Surveillance: national sensors

National strategies, policies and programmes for space defence in Europe

The full report provides a comprehensive overview of the national space defence landscapes in selected European member states.

European cooperation: intergovernmental and capability-oriented

Although military programmes are sensitive and military systems are owned and operated on a national basis, cooperation between European member states is sought whenever possible and deemed relevant, be it through bilateral or multilateral agreements or within the frame of intergovernmental organisations. Military assets are therefore most often exploited to the benefit of a broader multinational community, in particular with European partners. Beyond pooling and sharing of military space capabilities, European states may also cooperate in the development and acquisition of the systems. Motives for cooperation can be diverse, including strategic, operational and financial, but do not necessarily mirror a fully shared vision on space defence issues among partners.

Three types of intergovernmental cooperation can be identified, which differ in the depth of cooperation:

- **Exchange of capacities**, when states grant tasking rights to their national assets to their partner in exchange of similar rights on its systems; however, each state keeps its own ground segment, thus preventing images requested by one member of the cooperation from being shared with the other. Yet, **this kind of agreement leads to some interdependence based on complementarity**.
- **Delegation**, when one country is the main manager and recipient of a programme, but receives support (mostly financial) from other countries in exchange of tasking rights. **This model entails a strong centralisation on the leading state but creates a “community of interests”**, triggering common work and discussions among all partners, as they all have a direct stake in the programme. However, ground segments remain national and the leading country does not have access to the images that its partners request.
- **Partnership** is characterized by a much more balanced relationship between two partners (in terms of financial contribution and rights to the capabilities developed). **This model requires a strong convergence of strategic interests and operational needs as well as a high level of trust**, as participating countries share the same satellites and, therefore, sensitive data like operational parameters; however, each partner operates its own payload.

European programmes involving such cooperation schemes are numerous:

	Programmes
Exchange of capacities	<ul style="list-style-type: none"> • Helios 2 (FR) – SAR-Lupe (DE) • Pleiades/Helios 2 (FR) – COSMO-SkyMed (IT) • CSO (FR) – SARah (DE) (upcoming) • CSO (FR) – COSMO-SkyMed Second Generation (IT) (upcoming) (+ potentially, MUSIS’ Common Interoperability Layer)
Delegation	<ul style="list-style-type: none"> • Helios 2 (FR, IT, ES, GR, BE) • Pleiades (FR, ES, BE, AT, SE)
Partnership	<ul style="list-style-type: none"> • Athena-Fidus (FR, IT) • Sicral 2 (IT, FR)

European programmes according to their model of cooperation

NATO is also an important framework for intergovernmental cooperation in the space defence domain. The alliance is a crucial component of many European countries’ collective defence. In the past NATO owned its own satcom system (i.e. NATO I, II, III, IV). Since 2010, NATO has relied on capabilities put at its disposal by some of its member states as well as on commercial solutions, especially in the realm of SATCOMs. As other defence stakeholders, the Alliance is also changing its approach to space defence with the recent adoption of a new policy in this domain. Given the importance of space in the conduct of military operations and the fact that, even if national assets are used, the Alliance as a whole relies on the services they provide, NATO members approved in June 2019 a space policy for the organisation, and declared space as an operational military domain in December of that year.

European cooperation in military space programmes raises the question of a collective approach to ensure the protection of European assets from accidental and intentional harm, in particular in the changing operational and international context described previously. This question will become increasingly important with the development of European cooperation in the field of space defence and in light of future developments of flagship EU programmes with key defence applications.

European Union, fostering synergies between space and defence frameworks

European cooperation in space defence matters will be further shaped by the increasingly important role of the European Union in both space and defence domains.

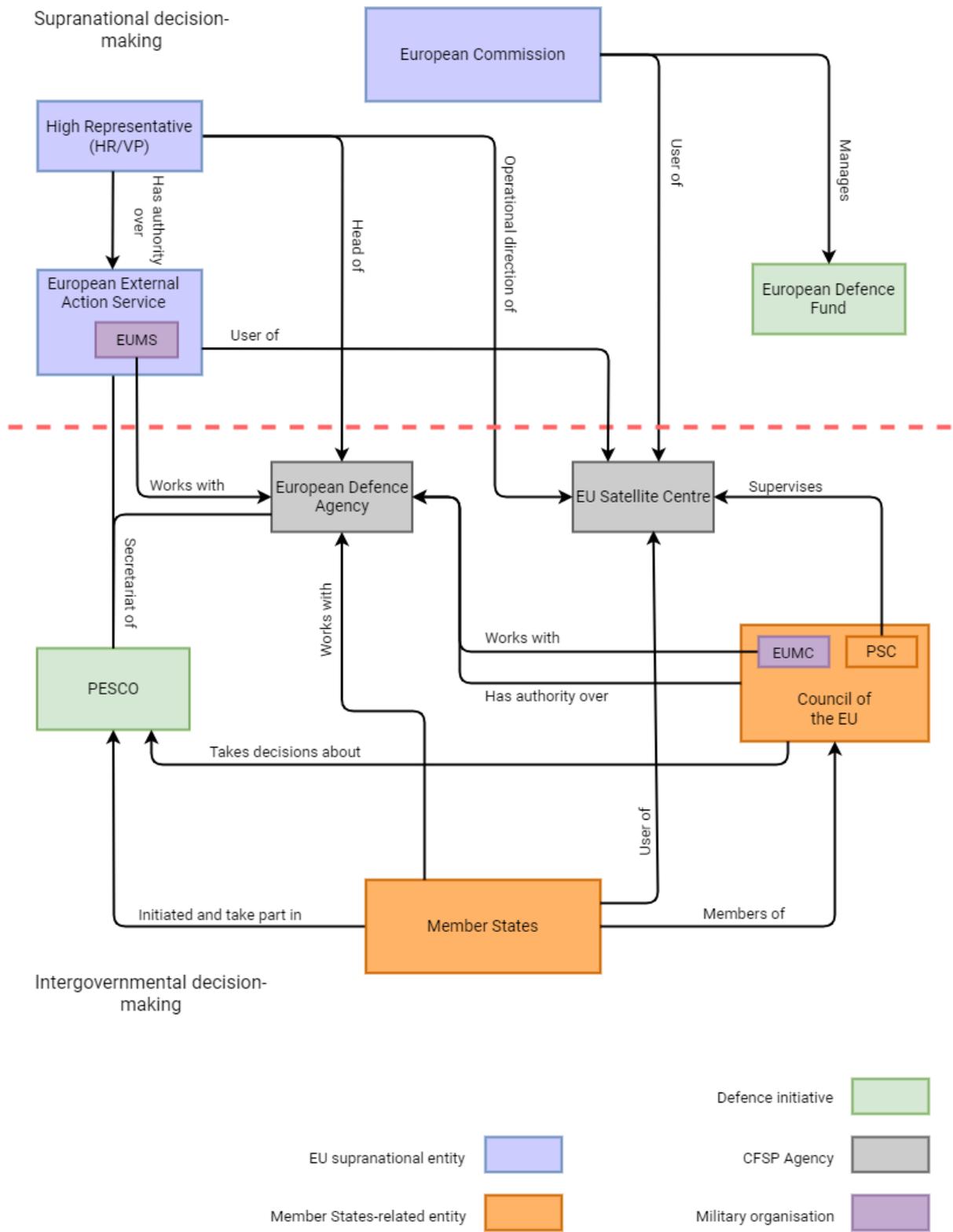
In the space domain, the 2014-2020 period was marked by the considerable progress achieved by EU space programmes, in particular Copernicus, which already delivers a range of different services and Galileo, which will soon reach full operation. The announcement of new EU initiatives in the field of GOVSATCOM and SSA/STM will further position the Union as a central actor of the European space sector, in particular for security-oriented applications.

In the security and defence domains, the EU continues to expand its competence and role with the development of a coherent framework to foster European cooperation and support a variety of strategic objectives. Things accelerated recently with the adoption of new initiatives including a European Defence Fund to support investment in joint research and the joint development of defence equipment and technologies.

Space-related initiatives have been integrated in components of the EU security & defence framework at all levels:

- **At the policy level,** e.g. creation of a Space Task Force within the EEAS; acknowledgement of space-related issues in the EU Global Strategy.
- **At the capability development and funding level,** e.g. space cooperative projects under PESCO; EDA’s work on space capabilities.
- **At the user level,** e.g. SatGen’s use of Copernicus to provide Support to EU External Action (SEA).

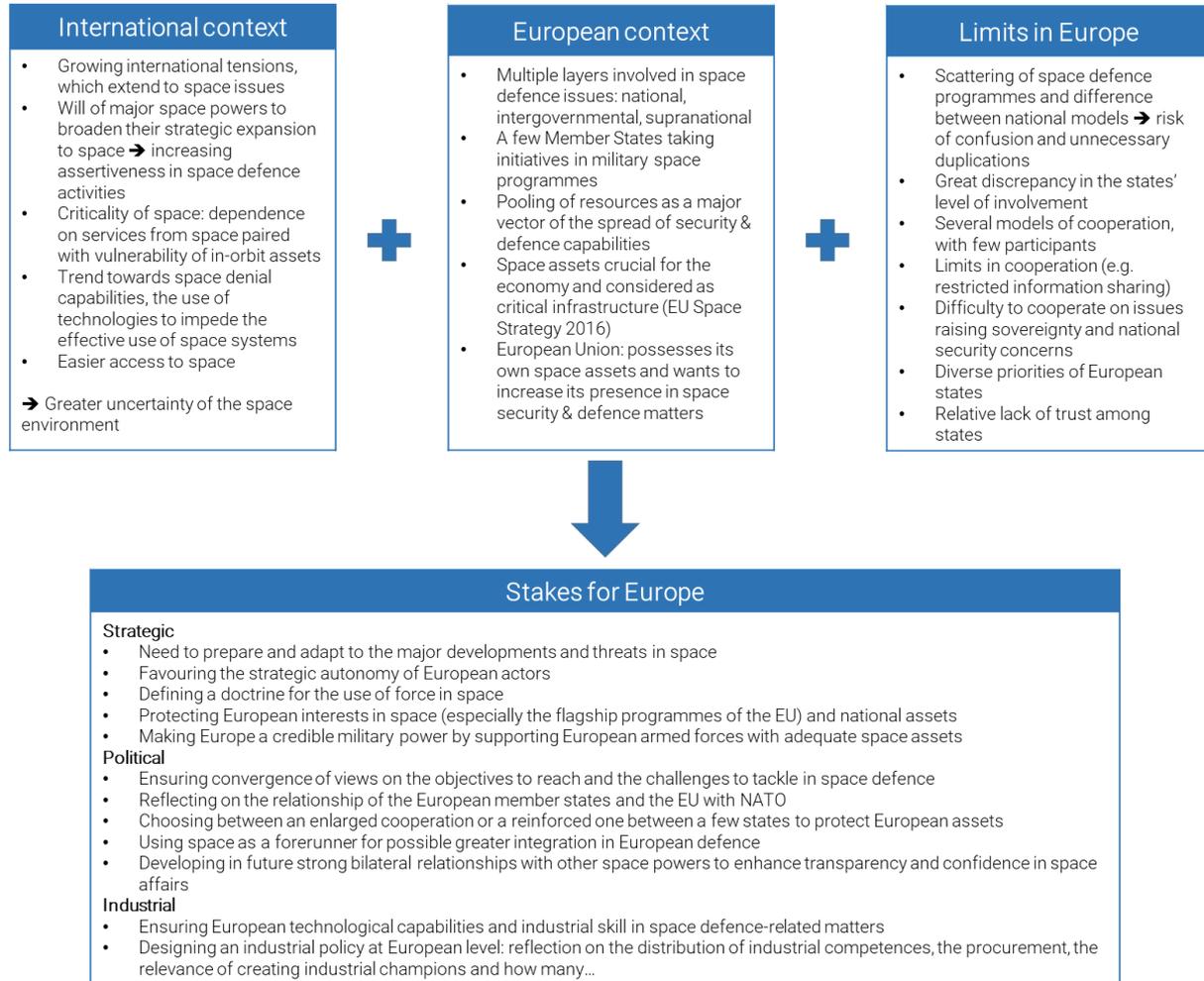
The progress of the Union in these domains, and the strong synergy between them, were embodied by the establishment of a new Directorate-General for Defence Industry and Space. The establishment of this new Directorate-General marks a crucial step forward in a long-standing political development process. This pairing clearly yields an interesting dynamic regarding the long-term development of both sectors in the EU framework, paves the way to further potential synergies and raises important questions for the future conduct of EU space affairs. In particular, questions arise on how defence-oriented applications and operations will be further integrated in the EU space programme and how this rapprochement will impact the EU space agenda and priorities, for example with regards to strategic autonomy and defence doctrine.



The EU Security & Defence framework

TOWARDS A EUROPEAN SPACE SECURITY & DEFENCE POLICY

The evolving international environment as well as transformations within Europe create new stakes for European actors that can be described as follows:



Stakes for Europe in the space defence field

The report identifies **seven key aspects** to be considered if Europe does not want to be left out from ongoing developments in the space defence field, which could be integrated into a European Space Security & Defence Policy:

1. **Agreeing on a shared global vision:** Space has been recognized as a strategic domain by European states, sometimes for different reasons. Therefore, to achieve a sufficient degree of convergence on space defence issues, broader geopolitical visions have to be harmonised. For instance, a common understanding of the European autonomy concept should be developed.
2. **Ensuring complementarity between national, intergovernmental and supranational responsibilities:** Given the complexity of the European landscape and the multiplicity of layers involved, coordination and complementarity of activities are necessary (and challenging) to avoid unnecessary duplications. Clarification of roles and responsibilities is required, as well as the definition of adequate mechanisms for decision-making among European actors. Activities will continue to be structured at three different levels: at supranational level wherever necessary; at intergovernmental

level whenever possible and at national level when sovereignty concerns prevail. All these levels are indeed relevant, depending on the circumstances faced.

3. **Increasing trust in military matters among cooperating partners:** Even if a high degree of trust already exists among European states, national concerns remain a source of limitation for mutual trust. Yet, further progress can be expected in the space defence field, even if the establishment of a European space defence will not emerge before the conditions are met at the political level. Moreover, it is also paramount that trust be built at the operational level of military actors, who can sometimes express reluctance, and not only at political level. To do so, promoting a more outward-oriented culture and implementing concrete cooperation among actors on the field look like potential solutions.
4. **Reflecting on a military doctrine for space:** While the topic is divisive among European states, Europe will have to develop its own vision to define under which conditions the use of force in space could be envisaged or not, and the kind of actions that could be executed to prevent it. Reflecting on deterrence and the right of self-defence could drive difficult discussions. Finally, several themes currently discussed in other parts of the world will have to be kept in mind: the means to anticipate and prepare for a conflict in space; the deterrence measures to be applied; and the ways to improve resilience of space assets. Intergovernmental cooperation has added value to facilitate their implementation.
5. **Safeguarding the sustainability of European space industry:** External factors are creating a greater competition for European players. Yet, if Europe wants to be able to develop a space defence sector, it has first to maintain its broader space industry. While military activities already contribute to support the industry, greater European investment and adaptation of the industry to make it more competitive are responses to be proposed. In this respect, the intertwining between space civil and military sectors makes difficult to consider them separately as each sector needs the other to be commercially viable, and therefore affordable to European institutions.
6. **Contemplating a potential European space industrial policy:** The distribution of industrial capabilities has to be solved because developing them is a main driver of investment in space for states and because high stakes are linked to it (e.g. ensuring industrial autonomy for critical technologies). Creating complementarity between space defence-related industrial capabilities, in the same vein as what ESA does for civil programmes, is difficult as it requires strong interdependence between states. Moreover, there is a gap in capabilities among Member States, which may widen in an ESA-like intergovernmental cooperation model. Two alternatives can be proposed: either a supranational model under the authority of the EU or a restricted intergovernmental model which gathers a few member states taking charge of the protection of EU space infrastructures along with their national assets.
7. **Recognising the crucial nature of political will:** Any progress on space defence is conditional on a strong political will from European states (to accept change leading to a modification of governance) and from the European Union (to come up with a joint vision compelling enough for member states). Indeed, cooperation in space defence cannot benefit from “spillover effects” (where integration in one economic or industrial sector creates incentives for integration in others) and needs to be initiated at political level given its interrelatedness with sovereignty and national security concerns.

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ESPI is the European think-tank for space. The Institute is a not-for-profit organisation based in Vienna, World capital of space diplomacy, providing decision-makers with an informed view on mid to long-term issues relevant to Europe's space activities since 2003.

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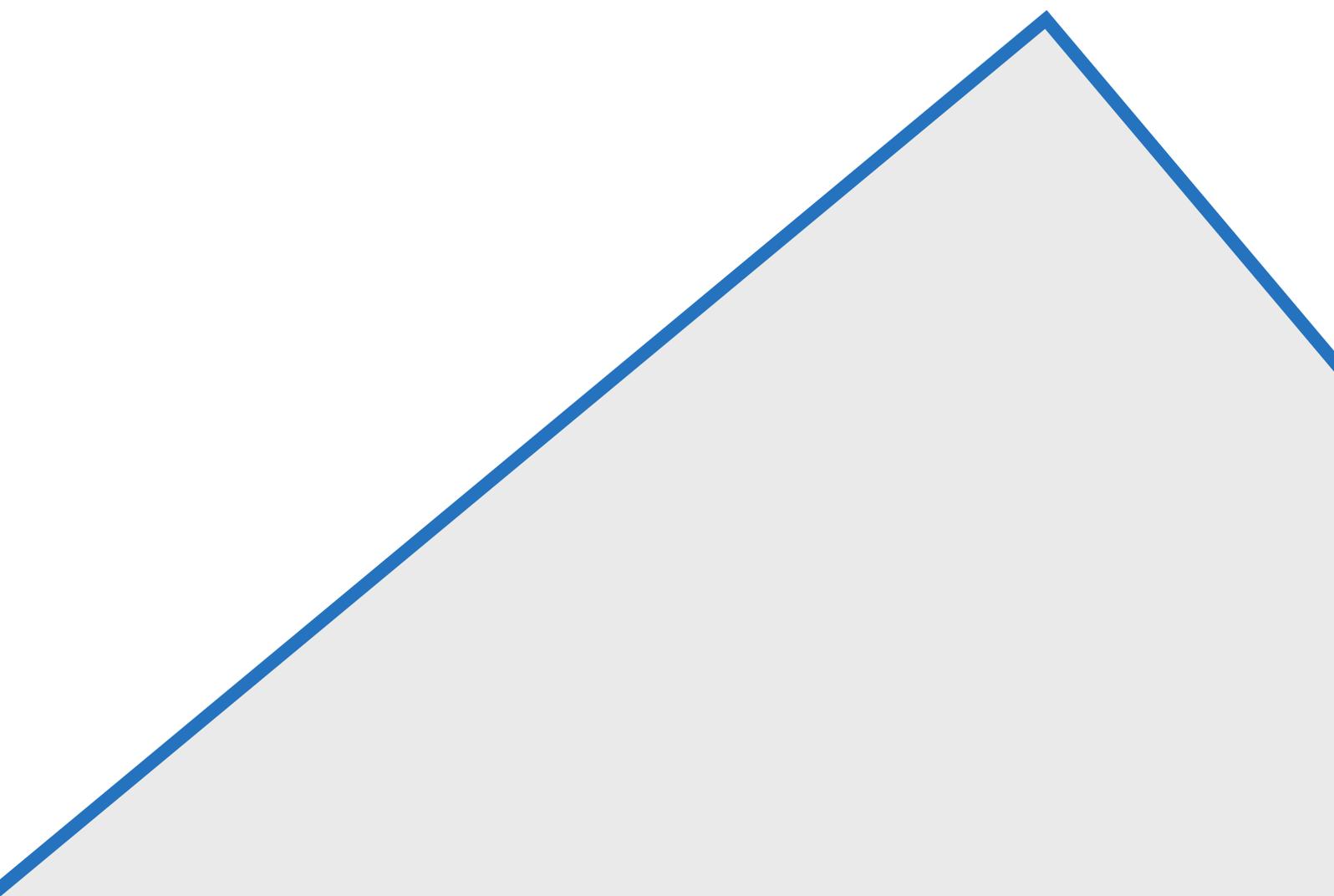
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