SWP Comment
NO. 2 JANUARY 2026

European Autonomy in Space

Space Systems as a Pillar of European Defence

Juliana Süß

Space capabilities are a core element of any modern defence arsenal. In Europe, however, military space capabilities are limited and dependence on the United States remains high. Europe must develop its capabilities in order to reduce dependencies and enhance its capacity to act on its own, thereby fostering European autonomy. To ensure that European space capabilities are developed efficiently, it is necessary to identify which dependencies on the US are particularly critical and which obstacles would hinder the development of such capabilities. Priority should be given to space situational awareness, military reconnaissance, navigation resilience and missile early warning.

During Russia's war against Ukraine and following the re-election of Donald Trump, two things have become clear to European decision-makers. First, space-enabled military capabilities would be decisive in a potential conflict between Russia and NATO. Second, the availability of US space capabilities cannot be taken for granted under any and all circumstances.

The war in Ukraine has underscored that satellite data are essential for military operations, including the identification of targets. Thus, such capabilities are not only targets of interest for adversaries but can also be subject to political instrumentalisation. In the spring of 2025, the Trump administration withheld satellite data from Ukrainian forces and used them as leverage to pressure the Ukrainian government to enter into negotiations with Russia under unfavourable conditions. Ukraine is not an isolated case in this regard: many of the capabilities on which Europe relies for its defence are based on US satellite systems, particularly in the fields of intelligence and navigation. Given the growing threat posed by Russia and declining trust in the US as a reliable partner, it is therefore imperative that Europe develop and expand its own space capabilities.

Europe's Capacity to Act in Space

In defence, there are four core capabilities based on satellite services: communications, intelligence, navigation and missile early warning. In order for there to be any benefit from satellite systems, additional enablers are required, such as launch capabilities and the ability to maintain accurate space situational awareness. Europe remains highly dependent on the US, particularly in the areas of intelligence, navigation and

Stiftung Wissenschaft und Politik
German Institute for International and Security Affairs

early warning. Moreover, space situational awareness relies in part on data provided by the US, while European satellites are often launched into orbit by US private companies.

Expanding Europe's own capabilities — and thereby increasing its capacity to act — is a process, and there may not be a clearly defined endpoint in the associated pursuit of autonomy. For Europe, the process begins with the reduction of dependencies, which will demand certain trade-offs: a capability that can be scaled up quickly is not necessarily the one needed most urgently. To what extent a given capability is necessary depends both on the degree of dependence and on how severe the consequences would be if the US were no longer to provide that capability.

The timeline that should now be developed must strike a balance between what is feasible and what is necessary. In military intelligence, capabilities can be scaled up relatively quickly through the use of commercial data. But in space-based missile early warning, it makes more sense to develop Europe's own capabilities. Initially, these could complement US systems rather than replace them in full.

Europe is not a homogeneous actor in space. Individual European states have their own space capabilities and participate in multilateral structures such as NATO and the EU. The Atlantic alliance neither procures nor operate its own satellites but instead coordinates the capabilities of its member states. The EU, by contrast, already operates two satellite constellations: one for observation of Earth (Copernicus) and one for navigation (Galileo). At the same time, it is pursuing the deployment of a communications constellation (IRIS^2).

Launch Capabilities

A fundamental prerequisite for autonomous space actors is the ability to launch satellites with one's own rockets. Currently, the majority of European satellites are launched by the US company SpaceX. Thanks in part to its reusable rocket engines, SpaceX offers the most frequent launch services and, furthermore, is comparatively cost-effective.

To date, SpaceX has proved reliable. Nevertheless, relying on just one US commercial provider entails risks; and this would be especially the case if SpaceX were to become a single point of failure. From a purely economic perspective, it is unlikely that the company would turn away European customers; but an interruption due to political reasons cannot be ruled out. For instance, priority could be given to US satellites used for military purposes. While the risk of losing access to all SpaceX services is low, such an eventuality would have severe consequences, as Europe's capabilities to independently launch satellites into orbit are very limited.

The European heavy-lift launch vehicle Ariane 6, which has been financed and developed by the member states of the European Space Agency (ESA), would be capable of reaching the strategically important geostationary orbit (at an altitude of approximately 36,000 km above Earth); however, it is still unclear how frequently the launcher can be used. The current near-term goal is for Ariane 6 to carry out up to 10 launches per year, but if and when such a launch cadence can be achieved remains unknown.

Several obstacles complicate Europe's efforts to establish its own launch market. First, the European satellite market is comparatively small and thus demand for launch services is low, accounting for approximately 1 per cent of the global launch market. However, the interdependence between the satellite market and launch capabilities suggests that the planned expansion of European space capabilities and the associated commercial growth, are likely to have a positive impact on the European launch market.

Second, a structural transformation is required — one in which European demand is consolidated. Only in this way can sufficient demand be generated and the launch market made competitive. To this end, the European Launcher Challenge by ESA and the European Flight Ticket Initiative by ESA and the EU have been established. Both ini-

tiatives provide financial support to launch companies, with ESA serving ultimately as anchor customer. As both are still at an early stage of development, it is too soon to assess how successful they will be.

Europe has demonstrated that it can develop and launch its own rockets. The key challenge now is for ESA and the EU to structure the launch market efficiently so that European launch capabilities are economically attractive for regional companies.

Space Situational Awareness

Space situational awareness enables the monitoring of events and potential threats in space, as well as the tracking of one's own satellites. Threats can include other satellites equipped with weapons systems or surveillance technology. For instance, in September 2025 Germany reported that a Russian satellite appeared to be shadowing a communications satellite used by the Bundeswehr, presumably with the intent to commit espionage. Continuous monitoring of the space environment is therefore crucial for the protection of national satellite systems.

European space actors use ground-based radar stations to collect data on the space environment. Some of these data are shared through multilateral vehicles, such as the EU Space Surveillance and Tracking (EU SST) system. However, for operationally relevant information — such as when hostile satellites are approaching one's own — European capabilities are insufficient and Europe has to rely on the more detailed data provided by the US military. Thus, a gap is evident in Europe's space defence and deterrence capabilities.

Continuing to share data with Europe is in the United States' interest, as this practice helps create a safer space environment. Nevertheless, there is a risk of the US being unable to provide its data or able to do so only with a delay, which could have serious consequences. Such a scenario might materialise if the United States were to become involved in a conflict — and particularly if American satellite systems themselves were targeted.

Building a comprehensive space situational awareness system is a complex undertaking that requires massive investments. The barriers to Europe developing independent capabilities are significant, not least owing to its starting position. Even in the United States, the development process is not considered complete: over the next four years, US$1.7 billion will be spent solely on the country's ground-based radar capabilities. With substantial financial resources, Europe could expand its capabilities; however, structural and political issues still need to be addressed. Right now, it remains unclear whether individual states will continue to invest in their own capabilities or whether a multilateral system within the EU or ESA is to be pursued.

Satellite Communication

Satellite communication is essential for modern defence, including for command and control purposes and the networking of sensors. Europe possesses some national capabilities that enables satellite communication, while NATO consolidates the communications satellite systems of France, the United Kingdom, Italy and the United States.

For this reason, Europe's dependence on the US in the field of satellite communication is comparatively low at present. However, demands on communication networks are increasing: more bandwidth is needed as the volume of data to be processed increases in sensor-rich battlefields. In practice, this means that a resilient network is required to connect sensors and transmit data in a timely manner. This is underscored by the German armed forces' vision of Multi-Domain Operations (MDO), which is also being pursued by NATO. MDO entails military operations across all domains, for which synchronisation is essential. It demands a network that not only provides sufficient bandwidth but is also resilient and interoperable. To achieve this data capacity, it is very likely that at least part

of the network will have to be space-based. The war in Ukraine provides a pointer on how this might work, at least in relation to drones: SpaceX's Starlink satellite constellation offers connectivity with high data capacity via an internet connection and can thus be used for drone operations. Thanks to the simple internet connection, the system is interoperable without requiring additional linkages. Moreover, software updates have proved that it is highly resilient.

However, European dependence on Starlink would be risky — and not just because it is potentially a single (not to mention commercial) point of failure. According to anonymous sources, the Trump administration instrumentalised Starlink on one occasion and used it as a political lever, although SpaceX CEO Elon Musk has denied that happened. Media reports suggest the Trump administration was acting in relation to Ukraine, despite Poland having paid SpaceX around US$50 million per year to maintain the service for Kyiv. While, ultimately, the service was not suspended, the incident demonstrated that the political interests of the US government could override the commercial interests of a company.

Europe is in possession of several communications satellite systems that enable military communication. These systems form part of the capabilities of the major European space actors — France, the UK, Italy and Germany. However, even if they are able to provide high data capacity and fast transmission, it is unlikely that demand can be met in full without commercial service providers. Furthermore, there is the question of resilience: building a resilient system requires both diversity and redundancy.

Europe would need a system similar to Starlink to connect a large number of sensors via satellite networks and ensure seamless interoperability. Potential European alternatives — such as the commercial OneWeb constellation or the planned EU constellation IRIS^2 — remain qualitatively inferior or come with uncertainty as regards their timeline for completion. Thus, while Europe is independent in satellite communication for command and control, it is not yet autonomous in sensor networking.

In order to meet demand, Europe will have to establish a constellation — in other words, hundreds of satellites. Such an undertaking faces several challenges, particularly regarding production capacity and scaling. At present, European companies have no experience in the mass production of satellites, owing to what, historically, has been insufficient demand. Moreover, there are deficiencies in the supply chains. Many components are imported: among other things, Europe relies on supplies of electrical, electronic, and electromechanical parts, as well as software, from outside the region. That reliance could prove critical in the event of a conflict. Consequently, states should encourage their domestic industries to assess whether components would remain available in times of crisis. Furthermore, companies should be asked to ensure that components — especially security-relevant or highly innovative ones — are adequately protected against sabotage and industrial espionage.

Some of these challenges, including production and scaling, could be addressed simply through increased funding. The cost of the newly planned satellite factory in Berlin of the US company Planet Labs, is in the eight-figure range, which illustrates the high initial investment required to build such infrastructure. Projects of this kind need to be supported financially not only by individual European states but also by the EU so that European companies remain in the region and Europe itself is able to benefit from their products and services.

Finally, bureaucratic hurdles further complicate cooperation among European companies. A unified legal framework is still lacking. Although the EU has published a draft European Space Law, that legislation is not expected to enter into force until 2030. Therefore, it remains to be seen to what extent the new law will create more favourable conditions for industry in which capacities can be pooled and scaling facilitated.

Intelligence, Surveillance and Reconnaissance (ISR)

Satellite imagery enables secure, rapid and precise reconnaissance; and, for this reason, it is an important component of modern warfare — for example, in target acquisition. Space-based intelligence data are currently shared by NATO members, with the US possessing by far the most ISR satellites. The number of satellites is relevant because it is not only the resolution of a satellite image that matters but also the revisit rate (that is, the frequency with which a satellite passes over the same point on Earth, allowing the data to be updated).

At the same time, it is important to note that the United States has used the exchange or provision of intelligence data for political purposes, namely, in March 2025, when the flow of satellite data to Ukraine was suspended. This affected not only data from the US military but also from the commercial provider Maxar. Even though the provision of data to Ukraine was not within the framework of NATO but on a bilateral basis, it cannot be ruled out that the US will also withhold reconnaissance data from European NATO states — at least temporarily — perhaps to encourage European countries to invest more in their own capabilities.

In addition, the process of data sharing within NATO is not a trouble-free one, even under "normal" conditions. Different IT systems complicate that process; and in some cases, real-time transmission is not possible. This means that it is not even necessary to deliberately withhold intelligence data — a delay in US release could in itself undermine a European mission. And as is the case in space situational awareness, data could be delayed or only transmitted in part owing to increased US internal demand.

Europe's own space-based intelligence capabilities are limited. They consist of small constellations owned by Germany, France and Italy that enable military reconnaissance through optical and radar sensors. The United Kingdom, Spain and Poland are planning to have capabilities in this area, too. Thus, the revisit rate of European capabilities is currently low, preventing a comprehensive, continuously available situational picture from being formed.

The hurdles to building Europe's own reconnaissance satellites on a large scale are similar to those for communications satellites: gaps exist, above all, in production capacity, scaling and supply chains. However, unlike in the communications sector, there are already suitable commercial providers on the market that could fill these gaps, such as the Finnish company ICEYE. But in contrast with the United States, the integration of commercial services into military structures is proceeding only slowly in Europe. NATO wants that to change, but it remains uncertain how successful the initiatives planned by the alliance will be.

The continued resistance towards commercial integration will require a cultural shift in order to overcome this historic lack of investment. Europe's total spending on space over the past 40 years amounts to just 15—20 per cent of the investments made in US space activities over the same period. In the United States, the potential value of commercial actors was recognised at an early stage and procurement processes modernised. If Europe is to seek the closer integration of its commercial capabilities into military operations, stronger support will be required at both the national and EU level. That means long-term contracts, which will allow industry to plan and invest, as well as an overhaul of procurement processes. Moreover, it will be up to NATO to integrate these partners into military infrastructures and enable unified, time-critical data transmission. In addition, personnel will need to be trained to analyse the data and processes optimised.

Positioning, Navigation and Timing (PNT)

PNT services are essential for command and control and critical for weapons systems that rely on navigation signals for guidance, such as precision-guided munitions. The US Global Positioning System (GPS) for troop command and control is used by NATO and

integrated into all weapons systems guided by satellite-based navigation signals. Theoretically, this gives the United States the ability to degrade or even disable the capability of supplied weapons systems to receive GPS signals — for example, through software updates.

Ultimately, the extent of Europe's dependence on software updates in weapons systems depends on the respective system. But as long as Europe continues to procure US weapons systems, limitations in range or targeting accuracy remain at least a theoretical possibility, not least if — for political reasons — the United States were to disagree about the intended use of the weapons or the target. Even in the event of a collective defence scenario under Article 5 of the NATO Treaty, the US could consider certain targets too escalatory, especially if it were not a direct party to the conflict.

The EU possesses its own navigation satellite system, Galileo, which could, at least in theory, reduce Europe's dependence on the United States. The system was originally designed for civilian use, but the introduction of the Galileo Public Regulated Service provides an encrypted signal for governmental users. The German armed forces plan to develop multifunctional receivers for their equipment so that they can receive both GPS and Galileo signals. However, the timeline for completion is not yet known. Also unclear is whether the receivers can be integrated into US systems, which make up a large part of Europe's arsenal.

At the same time, it must be ensured that Galileo signals can be received in the event of a conflict, as it is relatively easy to disrupt satellite signals. Russian armed forces have significant electromagnetic warfare capabilities, such as jammers. In the event of a confrontation with Moscow, European systems would need to prove themselves against Russian systems, which have been developed over many years, received massive investments and are combat-tested.

While European projects aimed at enhancing resilience in navigation already exist, they remain in the planning phase. Meanwhile, the UK government has announced plans to develop a terrestrial long-range navigation system, which could be operational by 2028. Other European states should invest in ground-based alternatives, too; and these should be integrated into NATO's navigation infrastructure. Technology is not a barrier here, as long-range navigation systems were still being operated in Europe until just a few years ago. The main obstacles are political — for example, there is a lack of awareness of how vulnerable the electromagnetic spectrum is.

Missile Early Warning

Infrared sensors in space are capable of detecting the heat signature generated by a missile launch. Thus, they provide an early warning capability and generally give the attacked party more time to respond than ground-based radar systems. At the same time, space-based sensors make it possible to obtain a global overview of missile launches. At present, the United States is the only Western country to operate such a system.

As long as the US remains a member of NATO, it can be expected to share its missile early warning data with other members of the alliance in the event of an attack. Washington has no interest in the destruction of European territory, not least because European infrastructure — for example, the RAF Fylingdales radar station in northern England and NATO's Allied Air Command headquarters in Ramstein, Germany — constitutes an integral part of US capabilities. Therefore, concerns regarding the availability of early warning data are related, above all, to the risk of a potential overload on the US side, which could delay the transmission of data to Europe.

In the event of such a delay, Europe would have to rely solely on ground-based radar capabilities. Highly manoeuvrable and more advanced missile systems, such as hypersonic missiles, would likely be detected only at a late stage. Several projects aim to complement European radar capabilities with space-based sensors. They include TWISTER with its space component,

ODIN'S EYE, as well as JEWEL, which was recently announced by Germany and France and builds on ODIN'S EYE. However, no precise timeline has yet been established for either project. As a result, European missile defence — particularly with regard to space-based sensor capabilities — will remain dependent on the US at least in the medium term.

The obstacles to becoming more independent from the United States in missile early warning can be overcome. Europe has already invested in infrared technology and possesses the necessary technical know-how, although further investments are required. However, it is political issues that pose the greater challenge: as with space situational awareness, it must be clarified whether capabilities are to be procured multilaterally and how they should be operated ultimately. Because of the ways in which data sharing and the warning of member states are organised, missile early warning can function only within the NATO framework. In the medium term, the most realistic option is for European data to complement US capabilities.

Policy Recommendations

Europe's dependencies on the United States in the field of space technologies are significant. To build and further develop its own capabilities, Europe must prioritise space systems in order to avoid being overwhelmed by the scale of the task.

Navigation signals, data for space situational awareness, reconnaissance and missile early warning are capabilities whose availability is most at risk. At the same time, the requirements for space-based intelligence could be met relatively quickly through commercial means, provided that private companies received sufficient support. Further, the resilience of navigation signals could be improved in the short term if the issue were to be accorded more attention from policymakers.

By contrast, expanding European capabilities in space situational awareness and missile early warning is a long-term process — one that requires the resolution of structural questions regarding ownership and integration. In space situational awareness, the challenge is not only to expand existing capabilities but also to establish new processes; this could be achieved if more attention and funding were forthcoming. Similarly, the projects already initiated in the area of missile early warning require greater political focus and higher levels of investment.

Although the list of essential measures is long, these processes should be pursued simultaneously. Since they have different starting points and deal with different components, effective coordination would allow for parallel development without exhausting resources.

In the areas of launch capabilities and communications satellites, US economic interests remain aligned with European demand. Nevertheless, Europe should ensure that it does not become fully dependent on the United States in either area. Existing processes in European capability development must be continued and supported financially. And, particularly in the area of launch capabilities, European demand needs to be consolidated in order to enhance the overall competitiveness of the continent's space industry and enable organic growth of the launch market.

All of this requires not only the development and expansion of capabilities but also coordination within Europe and clear signalling toward the United States that space security is being taken seriously. To expand capabilities in a targeted manner, existing expertise and the state of domestic industry must be assessed at the national level. In its 2021 Integrated Review, the UK government introduced the "own, collaborate, access" procurement framework. Such an approach is advisable for all European states. It should be deployed, together with space security strategies, to determine which capabilities are needed and how they can best be procured: at the national level, in cooperation with partners or through commercial services. These national assessments must be

followed by efficient coordination and communication so that duplication at the European level can be avoided and burden-sharing within NATO managed more effectively. Given that the EU and NATO have different approaches, it is essential that they continue to engage in dialogue. Moreover, a security of information agreement between the two would be beneficial.

As these processes are designed to take place over the long term and US space capabilities will remain indispensable for Europe in the short to medium term, Europe must signal its willingness now to invest and to build its capabilities. Later, these capabilities could be integrated into US-led processes, such as intelligence sharing and missile early warning within NATO.

In the area of space-related issues, Germany has assumed a pioneering role in Europe — a role that the government outlines in its recently published Space Security Strategy. In 2025, German defence spending increased by more than €10 billion compared with 2024; and Defence Minister Pistorius has announced that €35 billion will be spent on military space capabilities over the next five years.

The German government should leverage this role to advance decision-making processes within Europe and make cooperation more efficient. To this end, it should ensure that knowledge is accessible, that new capabilities are handled transparently and that interoperability is considered from the outset. In addition, it must clarify which capabilities can be shared multilaterally or, as in the case of missile early warning, bilaterally (with its partner France). Given that Germany's Space Security Strategy foresees a "European space security architecture", it appears that this approach is already taking hold. Furthermore, an open and honest exchange with domestic industry and coordination among the Federal Ministry of Defence, the Federal Foreign Office, and the Ministry of Research, Technology and Space are necessary. In order to advance a regional approach, it is the German government's responsibility to engage in (potentially challenging) discussions with its European partners aimed at clarifying the threat landscape and raising awareness of the importance of the space dimension.

SWP
Stiftung Wissenschaft und Politik
German Institute for International and Security Affairs

Ludwigkirchplatz 3—4
10719 Berlin
Telephone +49 30 880 07-0
Fax +49 30 880 07-100
www.swp-berlin.org
swp@swp-berlin.org

ISSN (Print) 1861-1761
ISSN (Online) 2747-5107
DOI: 10.18449/2026C02

(English version of SWP-Aktuell 54/2025)

Juliana Süß is a researcher in SWP's International Security Research Division.
This Comment was produced within the framework of the Strategic Threat Analysis and Nuclear (Dis-)Order (STAND) project.