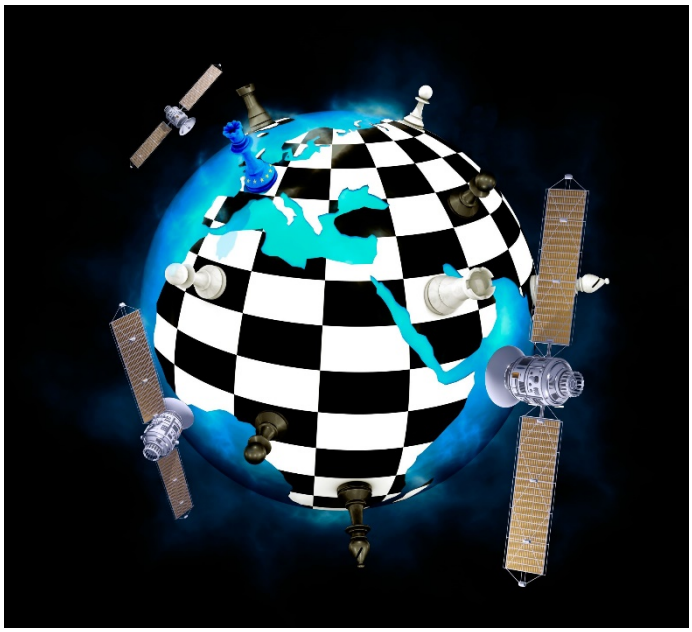
IN-DEPTH ANALYSIS

Requested by the SEDE Subcommittee

European Parliament

# The European space sector as an enabler of EU strategic autonomy



Policy Department for External Relations
Directorate General for External Policies of the Union
PE 653.620 - December 2020

EN

DIRECTORATE-GENERAL FOR EXTERNAL POLICIES
POLICY DEPARTMENT

European Parliament

IN-DEPTH ANALYSIS

# The European space sector as an enabler of EU strategic autonomy

## ABSTRACT

Today, the European Union can boast a degree of strategic autonomy in space. Projects such as Galileo have not only enhanced the EU's economy, but they may confer on the Union the ability to amplify its Common Foreign and Security Policy and Common Security and Defence Policy. While the EU continues to promote the safe, secure and sustainable use of space, it is also true that space is rapidly becoming a political arena that hangs over geopolitical competition on earth. Space is crucial for EU security and defence. Yet the EU is at a cross-roads and it needs to develop ways to ensure that it maintains its strategic autonomy in space. Without strategic autonomy in space, there can be no strategic autonomy on earth. There is a need for the Union to invest in its space presence, push the technological frontier in space, ensure that its ground- and space-based critical infrastructure is protected, ensure that its industrial supply chains are resilient and utilise new initiatives in security and defence to further enhance the EU's ability to act autonomously.

EP/EXPO/A/SEDE/FWC/2017-01/05
December 2020 - PE 653.620

EN

Policy Department, Directorate-General for External Policies

This paper was requested by the European Parliament's Subcommittee on Security and Defence

English-language manuscript was completed on 07 December 2020.

Printed in Belgium.

Author: Daniel FIOTT, Security and Defence Editor, EU Institute for Security Studies.

Official Responsible: Jérôme LEGRAND

Editorial Assistant: Daniela ADORNA DIAZ

Feedback of all kind is welcome. Please write to: jerome.legrand@europarl.europa.eu.

To obtain copies, please send a request to: poldep-expo@europarl.europa.eu

This paper will be published on the European Parliament's online database, 'Think tank'.



ISBN: 978-92-846-7527-2 (pdf)

doi:10.2861/983199 (pdf)

Catalogue number: QA-03-20-833-EN-N (PDF)

ISBN: 978-92-846-7528-9 (paper)

doi:10.2861/483221 (paper)

Catalogue number: QA-03-20-833-EN-C (paper)

# Table of contents

# Executive summary

The European Union (EU) can be proud of what it has achieved in space over the past few decades, and space is a domain where the EU has pressed its strategic autonomy. Despite initial doubts and suspicions by close partners and perhaps even some EU member states, the EU forged ahead with its own space objectives and today it can boast Copernicus as one of the leading earth observation systems. Galileo, after only an initial service of 2 years, has 1 billion users worldwide and the European Geostationary Navigation Overlay Service (EGNOS) helps augment this. Yet, it is too easy to become complacent. **The EU must strive to ensure that it matches political and financial commitment to its ambitions in space**, and this means also ensuring that Europe's space sector stays at the technological frontier and forging a common vision for EU space strategy. This is especially true during the pandemic where there is a potential risk of financial underinvestment, production delays and supply disruption. Strategic autonomy in space may be lost more easily than it was achieved.

This study looks at the ways in which the European space sector can be an enabler of EU strategic autonomy. It asks how should the EU understand space and strategic autonomy, what has the EU achieved in space and how this has contributed to the EU's strategic autonomy and what more is needed to enhance it. After looking at the growing geopoliticisation of space, a shifting market structure and new space technologies, this study argues that the EU could gear its space endeavours to two trends that are growing in importance. First, **space is a geopolitical realm** that is increasingly dominated by the United States, China and Russia and they are increasingly investing in space for national security concerns as well as economic competitiveness. Second, **space is a technological frontier** and the space sector is presently subject to rapid technological shifts marked by quantum computing and communications advances, nano technologies, advanced manufacturing and robotics and Artificial Intelligence (AI).

This current geopolitical context demands that the EU reframes how it sees its role in space – it lacks a coherent strategic approach and vision between EU institutions and member states. This means that questions about the EU's readiness and willingness to engage in space from a security and defence perspective are legitimate. In this regard, this study makes three broad recommendations to ensure that the EU can continue to enjoy strategic autonomy in space. First, the need for **persistent public investments** to advance launcher and satellite technologies, ensure a greater European physical presence in space through more missions, to initiate a new EU satellite constellation flagship project for extensive and high-speed broadband coverage and the technological advancement of Galileo. Second, a need to **harness the power of new technologies** such as advanced launchers, nano satellites and quantum communications backed up by investments, technology roadmaps and supply chain security in order to enhance the EU's digital transformation, connectivity, resilience and non-dependence. Third, to **plan for geopolitical competition and space** by developing more space-defence dual-use capabilities at the EU level and anchoring them in clearly articulated military requirements. The EU could use the "Strategic Compass" initiative to spell out clearly what defence-space capabilities the Union requires in a context where space and earth is congested with geopolitical rivalry.

# 1 Introduction

**Space is once again in the orbit of decision makers and the public**. The combination of new discoveries in space and the rise of space powers means that space remains a question of political, economic and even military intrigue. The United States (US) and France have established space forces, the North Atlantic Treaty Organisation (NATO) is creating a space centre, the United Kingdom (UK) intends to create a new space command, China has accelerated its space programme and landed on the moon, Russia is developing strategic space capabilities and commercial actors are working to launch hundreds of satellites into space to enhance internet connectivity for projects such as OneWeb and Starlink. Additionally, for the first time in history, SpaceX became the first company to launch National Aeronautics and Space Administration (NASA) astronauts into space in May 2020, as well as successfully test its vertical landing and reusable launch system. Space has also been billed as a frontier for potential mineral extraction and the application of nano-technologies and AI to satellites is gathering pace.

**Space remains a critical feature of civil and economic life**. The European Commission ("Commission") estimates that the European space economy contributed about €46-54 billion to the EU economy and some 230,000 highly-skilled professionals were employed by the sector in 2014.[1] Space helps the EU with maritime safety, emergency services, environmental monitoring, border management, agricultural sustainability, transport safety, telecommunications, civil protection and crisis management. The security aspects of space should not be neglected. In the context of climate change, for example, space-based assets are providing critical earth monitoring services that play a role in early warning and mitigation efforts. Risks from space debris and collision continue too, and the European Space Agency (ESA) has calculated that approximately 25,000 objects weighing over 8,700 tons were orbiting the earth in 2019[2] posing a risk to space infrastructure.

**Space is a vital component of any drive towards EU strategic autonomy** as it helps with situational awareness, decision-making and connectivity of technologies and systems. Copernicus, EGNOS and Galileo showcase European excellence in space and each of these capabilities provides the EU with positioning, monitoring and timing capacities. These programmes were conceived and developed despite concerns from partners, but today they contribute to the EU's economy and security in a significant way. Services such as Copernicus greatly contribute to the work of the EU Satellite Centre (SatCen), which in turn provides geospatial analysis that is critical for the implementation of Common Foreign and Security Policy (CFSP) and the Common Security and Defence Policy (CSDP). Space is a vital tool in the EU's diplomacy toolbox. It is for such reasons that in June 2020 the Council of the EU stressed that it is critical for the EU to maintain 'independent critical space systems'.[3]

The EU's space policy is, however, at somewhat of a cross-roads. This is a **critical moment for the EU in terms of its autonomy from technological and industrial dependences and the freedom to exploit space** for the specific needs and interests of the EU's economy and security.[4] Working within the parameters of the EU Space Programme (EUSP) over the 2021-2027 period, optimised investments will be a pre-condition for EU strategic autonomy in space. What is more, this is a challenging economic context

[1] European Commission, "Communication on a Space Strategy for Europe", *COM(2016) 705 final*, Brussels, October 26, 2016, p. 2, https://ec.europa.eu/docsroom/documents/19442.
[2] European Space Agency, "ESA Annual Space Environment Report", September 29, 2020, pp. 35-36, https://www.sdo.esoc.esa.int/environment_report/Space_Environment_Report_latest.pdf.
[3] Council of the EU, "Conclusions on Space for a Sustainable Europe", *8512/20*, Brussels, June 4, 2020, https://data.consilium.europa.eu/doc/document/ST-8512-2020-INIT/en/pdf.
[4] Daniel Fiott, "Strategic Autonomy: Towards 'European Sovereignty' in Defence?", *EUISS Brief*, no. 12, November, 2018, https://www.iss.europa.eu/sites/default/files/EUISSFiles/Brief%2012__Strategic%20Autonomy.pdf.

for the EU marked by the Covid-19 pandemic. While EU space assets have contributed to the response to Covid-19, there have been activity manufacturing shutdowns, launches have been postponed, programme delays and strains on supply chains.[5] The sector has already estimated that in commercial markets the industry could suffer a reduction of €1.2 billion by the end of 2020 and '[c]ancelled or delayed orders would also reduce the backlog of the industry by around €1.5 billion with long-term implications for the sector'.[6] Given the sense of urgency such figures raise, it is necessary to overcome the present period of economic uncertainty in the space sector. **The task is not only to weather the storm of Covid-19, but to ensure that the EU can maintain its overall strategic autonomy in space**.

**Failing to support the EU's strategic autonomy in space would undermine its broader efforts to enhance its security and defence**. Without space, it is not possible for the EU to become a geopolitical player. The EU Global Strategy (EUGS) stressed the need for 'the autonomy and security of [EU] space-based services' and permanent earth observation.[7] The follow on Council Conclusions of 14 November 2016 that outlined a new level of ambition for EU security and defence also stated that the EU must ensure stable and autonomous access to space.[8] The EU is responding to such calls with capability programmes under Permanent Structured Cooperation (PESCO), the European Defence Industrial Development Programme (EDIDP) and the Preparatory Action on Defence Research (PADR).[9] The creation of a Directorate General for Defence Industry and Space (DG DEFIS) to oversee these and future investments has been established to advance the EU's strategic autonomy in space. Finally, it should also be recalled that space has been identified as a key priority under the EU Capability Development Plan (CDP) and that in the 2020 Coordinated Annual Report on Defence (CARD) "defence in space" is specifically highlighted as an area ripe for a common European approach and an area that needs to be integrated into the EU's wider space efforts.[10]

EU investments in space-defence capabilities come at a crucial time for the future of the EU's strategic autonomy in space. Indeed, **without sustained investments for ambitious space projects, the development of new cutting-edge space technologies and a drive to lower the EU's industrial dependences on critical supplies it will be extremely difficult to achieve EU strategic autonomy more generally**. To this end, this study seeks to better understand how Europe's space sector can be an enabler for EU strategic autonomy and it makes recommendations on what measures to take at the EU level. This study will be driven by three inter-related research questions: 1) how should the EU understand space and strategic autonomy?; 2) what has the EU achieved in space and how has this contributed to the EU's strategic autonomy, if at all?; and 3) what more is needed to enhance the EU's autonomy through space?

To answer these questions, this study is organised in three parts. Beyond this introduction, chapter one provides an overview of the academic literature on space and defence. It observes the actions of other actors in space and outlines the key debates involved in space and strategic autonomy. Chapter two then

[5] European Space Policy Institute, "COVID-19 and the European Space Sector", *ESPI Special Report*, July, 2020, p. 13, https://espi.or.at/news/new-espi-special-report-on-covid-19-and-the-european-space-sector and Eurospace, "Mitigating the Impact of the Pandemic on the European Space Industry", Position Paper, April 24, 2020, https://eurospace.org/wp-content/uploads/2020/04/eurospace-pp-on-covid19_final.pdf.

[6] *Op.Cit*., "COVID-19 and the European Space Sector", p. 13.

[7] "Shared Vision, Common Action: A Stronger Europe – A Global Strategy for the European Union's Foreign and Security Policy", June, 2016, p. 42, https://eeas.europa.eu/archives/docs/top_stories/pdf/eugs_review_web.pdf.

[8] Council of the EU, "Conclusions on Implementing the EU Global Strategy in the Area of Security and Defence", *14149/16*, Brussels, November 14, 2016, p. 8, https://www.consilium.europa.eu/media/22459/eugs-conclusions-st14149en16.pdf.

[9] European Commission, "The 12 categories of the EDIDP 2020 calls", March, 2020, https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1053.

[10] European Defence Agency, "Ministers presented with new opportunities for joint military capabilities to overcome fragmented European defence landscape", Press Release, 2020, https://www.eda.europa.eu/docs/default-source/press/card/press-release---card-report_en.pdf.

studies the current state of the EU and space and it specifies how the Union's strategic thinking may have evolved in light of shifting geopolitical trends, if at all. Chapter three identifies the key areas that inhibit further EU strategic autonomy in space and defence. The study ends with a conclusion and concrete recommendations on how to ensure that the European space sector can be an enabler of EU strategic autonomy. The study draws on primary and secondary sources and it benefits from several semi-structured interviews conducted with officials from the EU institutions and industry.[11]

# 2 Understanding space and strategic autonomy

Before ascertaining how autonomous the EU is in space and what more it needs to do to maintain this autonomy, it is first necessary to attain a better understanding of some of the concepts used in this study. To this end, this chapter provides a conceptual understanding of "strategic autonomy" in space by first outlining how scholars think of space as a commercial and military domain. The chapter then moves on to provide a specific definition of the concept of "strategic autonomy" and how it applies to space. Finally, the chapter contextualises how EU, non-EU states and organisations approach the use of space. It concludes by weighing up the strategic dimensions of space, before then turning to the second section on EU strategic autonomy in space.

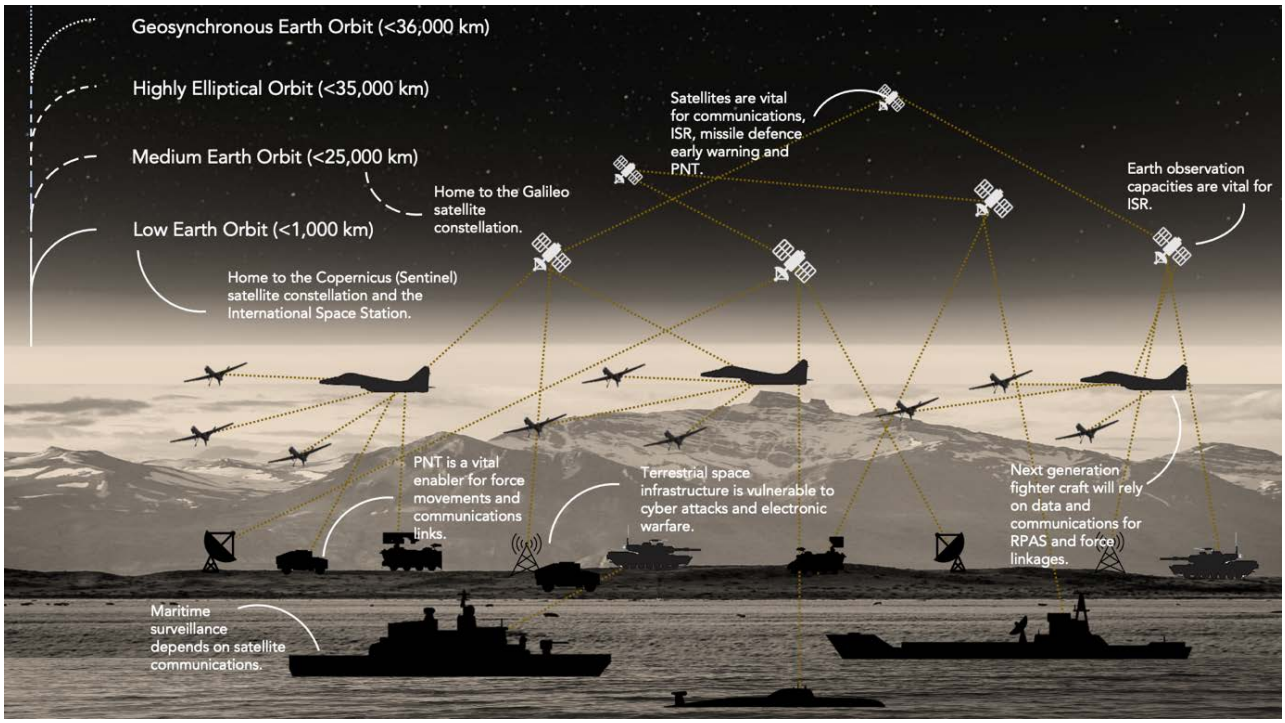
## 2.1 Space as a political realm

There is a **temptation to see space as something out of a sci-fi film** and there is hype around certain technologies that are supposed to alter space for good (e.g. space lasers and missiles). Such accounts are usually countered by normative appeals to 1967 Outer Space Treaty and the need to avoid any militarisation of space. These views are countered with the claim that such multilateral frameworks were put in place by great powers as 'a cover to buy time' for when they had the technological capacity and political need to militarise space.[12] This gives way to the notion that space powers should 'ignite a new space race almost at once' in order to secure as quickly as possible relative gains in space and on earth.[13] Others instead stress that the US, China or Russia would lose any "moral high-ground" if they ever did militarise space.[14] However, seeing these debates through a 'doves vs hawks' perspective loses the nuance of accounts that recognise that **while space is a domain that is increasingly open to weaponisation, there will be political costs for doing so**.

Space is a maritime-inspired branch of strategic studies and space is usually seen as an extra-terrestrial ocean. One account has even likened the open ocean to deep space and the Earth's orbit as a "celestial coastline".[15] The image of an open ocean may give us the impression that space is something that is conquerable, but this places 'an overemphasis on offensive strategy and operations, while tending to minimize defensive strategies and non-military methods'.[16] This is why the image of a "celestial coastline" is useful, as it **recognises that space is not a standalone strategic domain but one intimately linked to terrestrial politics**. Thus, 'wars on Earth may not be decided solely by what happens in space, and space may not necessarily be where a war begins', even if it is an essential domain in modern warfare and strategy.[17] It is for this reason that until now space has been seen as a defensive realm where Space Situational Awareness (SSA) rather than offensive strategies are favoured.

[11] Seven interviews were held with officials from the EU Military Staff, European External Action Service, DG DEFIS – European Commission, European Defence Agency, European Space Agency, EU Satellite Centre and ASD-Eurospace.
[12] Everett C. Dolman, *Astropolitik: Classical Geopolitics in the Space Age*, (London/Portland, OR: Frank Cass, 2002), p. 166.
[13] *Ibid*., p. 176.
[14] Joan Johnson-Freese, *Space Warfare in the 21st Century: Arming the Heavens* (London/New York: Routledge, 2017), p. 167.
[15] Bleddyn E. Bowen, *War in Space: Strategy, Spacepower, Geopolitics* (Edinburgh: Edinburgh University Press, 2020).
[16] John J. Klein, *Space Warfare: Strategy, Principles and Policy* (London/New York: Routledge, 2006), p. 163.
[17] Op.Cit., War in Space: Strategy, Spacepower, Geopolitics, p. 272.

**Figure 1:** Space as a geopolitical theatre




*Visual design: EU Institute for Security Studies, 2020*

## 2.2 Understanding 'strategic autonomy' in space

**Strategic autonomy is not a difficult concept to grasp**. However, to unpack and understand the concept there is a need to first interrogate the terms "strategic" and "autonomy" separately. On the one hand, it is necessary to assess whether a particular area of political and economic life is "strategic", as this may not always be the case. Intuitively, the term "strategic" comes into play when it relates to the core interests of a political community. On the other, if "autonomy" broadly equates to freedom then it is clear that we are talking about a spectrum of autonomy rather than some binary choice of either having autonomy or not.[18] When thinking about the "spectrum of autonomy" one is invited to reflect on three inter-related questions that form the fundamental basis for any discussion about the concept strategic autonomy: autonomy for, autonomy to and autonomy from.[19]

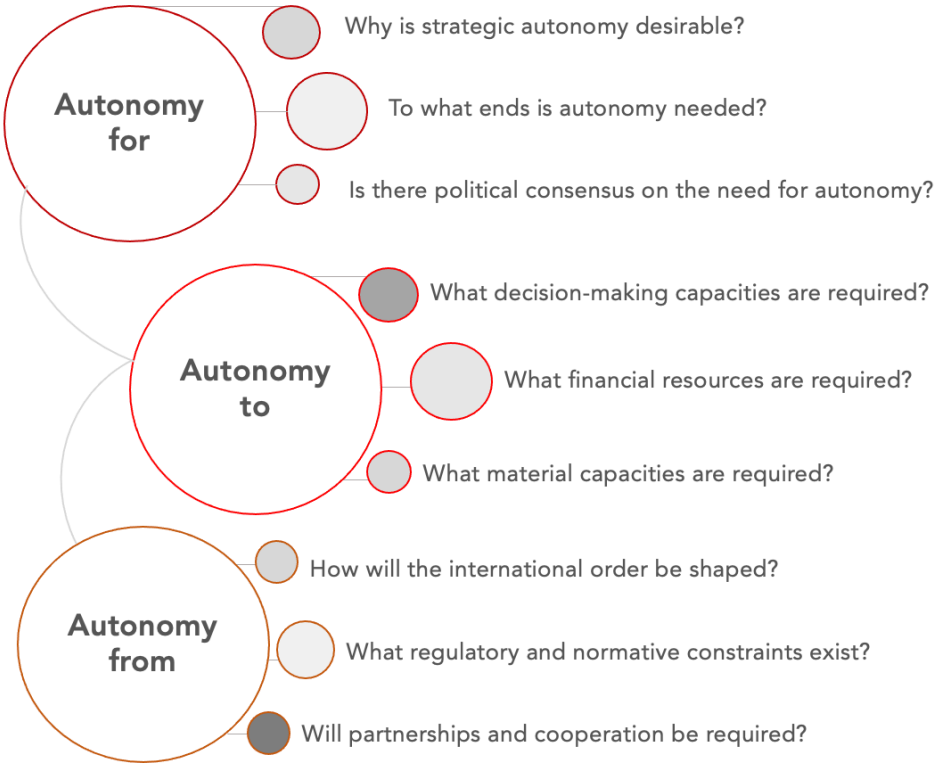
### 2.2.1 Autonomy for, to and from

Bringing the terms "strategic" and "autonomy" back together then, it can be said that a political community's drive to become more autonomous is in large part conditioned by how strategic the political or economic issue at hand is. In this study, we assume that **space is a strategic domain and there is a political ambition to enhance the EU's autonomy in space** so as to ensure the defence and economic prosperity of the EU (*autonomy for*). In fact, along with the defence industrial domain[20] there is a growing

[18] Daniel Fiott, "Strategic Autonomy: Towards 'European Sovereignty' in Defence?", *EUISS Brief*, no. 12, November, 2018, https://www.iss.europa.eu/sites/default/files/EUISSFiles/Brief%2012_Strategic%20Autonomy.pdf.
[19] This three-layered definition builds on the two-pronged approach taken in *Op.Cit.*, "Strategic Autonomy: Towards 'European Sovereignty' in Defence?".
[20] Suzana Anghel *et al.*, "On the Path to 'Strategic Autonomy': The EU in an Evolving Geopolitical Environment", European Parliamentary Research Service Study, September, 2020, p. 3, https://www.europarl.europa.eu/RegData/etudes/STUD/2020/652096/EPRS_STU(2020)652096_EN.pdf.

consensus in the Council of the EU that strategic autonomy in space is desirable.[21] Given that space is a domain that transcends defence, it is necessary to see space as an enabler for a wider autonomy that includes the EU's economic and financial interests too. In the era of greater digitalisation, technological intensity, geopolitical competition and the pandemic, there is a need for a wider application of the term strategic autonomy.[22]

**Figure 2:** Strategic autonomy and space




*Source: Visual design: EU Institute for Security Studies, 2020*

This study also assumes that the EU is striving to ensure that it has the political, diplomatic, financial and material resources needed to secure its strategic autonomy in space (*autonomy to*). In terms of decision-making capacity, the Commission's DG DEFIS is tasked with industrial policy and innovation through the EUSP, the European External Action Services' (EEAS) Space Task Force supports the Union's diplomatic and multilateral efforts, EU SatCen is an autonomous CFSP/CSDP capacity for geospatial intelligence and the European Defence Agency (EDA) focuses on space capability development. **Yet a technological and industrial base is the foundation on which strategic autonomy is built**.[23] Accordingly, while the EU is

[21] See the reference to 'the importance for the EU of European independent critical space systems' in *Op.Cit.*, "Conclusions on Space for a Sustainable Europe", p. 6.
[22] Niklas Helwig, "EU Strategic Autonomy: A Reality Check for Europe's Global Agenda", *FIIA Working Paper*, no. 119, October, 2020, https://www.fiia.fi/wp-content/uploads/2020/10/wp119_strategic_autonomy-2.pdf.
[23] Giovanni Grevi, "Strategic Autonomy for European Choices: The Key's to Europe's Shaping Power", *EPC Discussion Paper*, July 19, 2019, https://wms.flexious.be/editor/plugins/imagemanager/content/2140/PDF/2019/190719_Strategicautonomy_GG.pdf. See also Daniel Fiott, "Strategic Investment: Making Geopolitical Sense of the EU's Defence Industrial Policy", *EUISS Chaillot Paper*, no.

aspiring to become a technological leader in space it suffers from certain critical supply vulnerabilities. For example, one study explains that Europe has a dependence on the types of electrical, electronic and electromechanical components and advanced materials that make up about 40-70% of modern procurement costs for space equipment.[24] In space, strategic autonomy is measured in terms of what technology domains a political community can master and the critical supplies it relies upon.

Lastly, this study understands that the EU is attempting to lower its dependence on factors that may hinder its ability to secure its interests in space (*autonomy from*). This, of course, can be interpreted as lowering dependencies on critical supplies and resources but it is in fact a broader concern. **Strategic autonomy also implies an ability to shape the corpus of international law, regulations and processes so that they are conducive to the EU's interests**. This often includes the call for the EU to be a "rule maker" rather than "rule taker" in international affairs[25], and this is why space diplomacy is a critical component of the Union's strategy for autonomy in space. However, one area where the EU is a "rule taker" in space technologies and capability development is in relation to extra-territorial mechanisms such as the International Traffic in Arms Regulations (ITAR). In this regard, achieving autonomy from such mechanisms implies the EU is willing to develop components and software that are free from the reach of ITAR.[26] Additionally, the EU could decide that partnerships and cooperation are the only way to secure its interests, but this presumes that other space actors share similar strategic interests in space. As we will see in the next section, this is not always a given.

## 2.3 'Astropolitical' competition

One of the chief reasons why the EU is being pressed to think about its strategic autonomy in space is the rise of geopolitical competition – increasingly, competition on earth is spilling over into space.[27] **A handful of states are investing in new space defence technologies**. From a military perspective, disabling satellites or disrupting space-to-earth signalling and communications is a method of plunging terrestrial capabilities into "operational darkness". Modern military systems are almost completely dependent on space-based communications. For example, during Operation Desert Storm in 1990-1991 the US military was 85-90% dependent on space for missile launches, Intelligence, Surveillance and Reconnaissance (ISR) and communications.[28] Even in Europe, future defence programmes such as the Future Combat Aircraft System (FCAS) will depend on space for communications and positioning. Fighter jets, other strategic aircraft and Remotely Piloted Aircraft Systems (RPAS) will rely on satellite constellations for enhanced data collection and processing, Positioning, Navigation and Timing (PNT) and command and control (C2).[29]

156, December 13, 2019, https://www.iss.europa.eu/content/strategic-investment-making-geopolitical-sense-eus-defence-industrial-policy.

[24] Letizia Caito, "European Technological Non-Dependence in Space", *ESPI Report*, no. 51, September, 2015, p. 8.

[25] *Op.Cit.*, "Strategic Autonomy for European Choices: The Key's to Europe's Shaping Power".

[26] Peter B. de Selding, "U.S. ITAR satellite export regime's effects still strong in Europe", *Space News*, April 14, 2016, https://spacenews.com/u-s-itar-satellite-export-regimes-effects-still-strong-in-europe/. See also: European Space Policy Institute, "Space Policy Directive 2: ITAR, an Instrument of U.S. Dominance", ESPI Briefs, no. 27, December, 2018.

[27] Christoph Schwarz and Sofia-Maria Satanakis, "Space Race 2.0 – Renewed Great Power Competition in the Earth's Orbits", *AIES Fokus*, no. 6, 2020, https://www.aies.at/download/2020/AIES-Fokus-2020-06.pdf.

[28] Jeffrey Caton, "Joint Warfare and Military Dependence on Space", *Joint Forces Quarterly*, Winter, 1995-96, p. 49, https://apps.dtic.mil/dtic/tr/fulltext/u2/a525617.pdf.

[29] Airbus, "No Air Dominance without Space Dominance: How Space will make a Difference to FCAS", October 29, 2020, https://www.airbus.com/newsroom/stories/No-Air-dominance-without-Space-dominance.html.

**Figure 3:** Global launch activity, 2000-2019 (mass launched in tons)


*Data: Copyright by Eurospace – used with permission – reproduction forbidden.*

Technological and geopolitical frontiers in space are undergoing profound changes, and many terrestrial powers are already seizing on space as both a commercial and military domain.[30] Even without becoming directly drawn into geopolitical competition in space, **the EU will need a minimum capacity to protect space assets** in case of negative spill-overs from geopolitical competition. However, before falling for the hype about the rise of commercial space actors, we should keep in mind that public investments in space are on the rise globally. For example, one study estimates that public space investments grew by 44% from 2008 to 2017 (or from $52 billion in 2008 to $75 billion in 2017).[31] In space, governments still matter and the reality is that governments and public customers still account for the largest share of space launches (see Figure 3). Accordingly, **at present a process of politico-military adaptation in space is underway, and a renewed ambition to exploit space for defence purposes is taking hold**.

### 2.3.1 Politico-military adaptation

A number of space powers have adapted or created political institutions in order to prepare for space defence.[32] Following on from the creation of a Space Command in September 2019, France adapted its air

[30] Hugo van Manen *et al*., "Space: Satellites, Space Exploration and the Netherlands' National Security", *Strategic Alert*, The Hague Centre for Strategic Studies and Clingendael Institute, May, 2020, https://hcss.nl/sites/default/files/files/reports/Strategic_Alert_Space_final.pdf.

[31] OECD, *The Space Economy in Figures: How Space Contributes to the Global Economy* (Paris: OECD, 2019), https://www.oecd-ilibrary.org/science-and-technology/the-space-economy-in-figures_c5996201-en.

[32] Countries such as Japan are also developing their space-defence capacities and in 2020 the country announced that it would set up a 'Space Domain Mission Unit' within the Japan Air Self-Defence Force. See: Yuka Koshino, "Japan's New Space Domain Mission

force to an 'air and space force' in September 2020 to develop space doctrine, space defence capabilities and R&T and engage in military space exercises.[33] Such steps follow on from the French Space Defence Strategy of 2019, which stated that the creation of a French space force was required to concentrate political efforts and to ensure that the French Republic can maintain its national strategic autonomy in space.[34] Germany has also seen to the establishment of an Air and Space Operations Centre (ASOC) on 21 September 2020, which effectively brings together specialised centres on intelligence, security and situational awareness and underlines the growing importance Berlin pays to space.[35] Recent French and German efforts mirror those taken in the US, which, in December 2019, created its own 'Space Force' (USSF) in order to protect US 'interests and security in space' through the generation of skills and doctrine, as well as acquiring military space systems.[36] In its budgetary request for 2021, **the US administration has asked for some $18 billion for space and $15.4 billion for the new Space Force and other branches dealing with space activities**.[37] As the 2017 National Security Strategy makes clear, these planned investments are geared towards ensuring America's 'unfettered access to and freedom to operate in space'.[38] Recently, the UK also announced that as part of its £16.5 billion (€18.5 billion) defence spending injection over four years it would create a "Space Command" that would be charged with protecting UK space assets. London reports that it expects to launch the 'UK's first satellite launched from a UK rocket by 2022'.[39]

Leadership by NATO's major space powers has also spearheaded efforts inside the alliance. NATO's recent engagement in space began when defence ministers agreed a new space policy **on 27 June 2019 and the alliance officially declared space an operational domain** in December 2019 alongside air, land, sea and cyberspace[40]. NATO's first-ever space policy is designed to protect against aggression in space. The alliance's aim is to ensure that satellites cannot be 'hacked, jammed, or weaponised' and that they become resilient to Anti-Satellite Weapons (ASATs). Thus far, NATO's space policy rests on vigilance, resilience and deterrence.[41] Furthermore, on 22 October 2020 NATO defence ministers agreed to the creation of a new NATO Space Centre based at Allied Air Command in Ramstein, Germany.[42] NATO defence ministers want the centre to engage in space observation and awareness and to maintain the alliance's technological edge. The centre is to gather information and data on potential threats to satellites, as there are around 2,400 satellites in Earth's orbit - 60% of which belong to NATO countries or companies located in the alliance.[43]

Unit and Security in the Indo-Pacific Region", *IISS Military Balance Blog*, May 1, 2020, https://www.iiss.org/blogs/military-balance/2020/05/japan-space-domain-mission-unit-security.

[33] Ministère des armées, "Armée de l'air et de l'Espace", September 12, 2020, https://www.defense.gouv.fr/air/dossiers/armee-de-l-air-et-de-l-espace/le-logo.

[34] Ministère des armées, "Space Defence Strategy: Report of the 'Space' Working Group", 2019, https://www.defense.gouv.fr/content/download/574375/9839912/Space%20Defence%20Strategy%202019_France.pdf.

[35] Dominic Vogel, "German Armed Forces Approaching Outer Space", *SWP Comment*, 2020/C 49, October, 2020, https://www.swp-berlin.org/10.18449/2020C49/.

[36] US Air Force, "Letter to the Force", December 20, 2019, https://www.spaceforce.mil/About-Us/Letter-to-the-Force/.

[37] Theresa Hitchens, "Space Force nears year mark, acquisition remains a quagmire", *Breaking Defense*, October 2, 2020, https://breakingdefense.com/2020/10/as-space-force-nears-one-year-mark-acquisition-remains-a-quagmire/.

[38] President of the United States, "National Security Strategy of the United States of America", December, 2017, p. 31, https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf.

[39] UK Ministry of Defence, "Defence Secures Largest Investment Since the Cold War", November 19, 2020, https://www.gov.uk/government/news/defence-secures-largest-investment-since-the-cold-war.

[40] Kestutis Paulauskas, "Space: NATO's Latest Frontier", *NATO Review*, March 13, 2020, https://www.nato.int/docu/review/articles/2020/03/13/space-natos-latest-frontier/index.html.

[41] NATO, "Space is essential to NATO's defence and deterrence", October 14, 2019, https://www.nato.int/cps/en/natolive/news_169643.htm?selectedLocale=en.

[42] "NATO's Approach to Space", NATO, October 23, 2020, https://www.nato.int/cps/en/natohq/topics_175419.htm.

[43] "NATO plans new space center in Ramstein, Germany", *Deutsche Welle*, October 19, 2020, https://www.dw.com/en/nato-plans-new-space-center-in-ramstein-germany/a-55319344.

Space plays a role in Russian strategic thinking too, and Moscow reportedly has some 130 spacecraft in orbit as of 2016 – putting it just behind the US and China.[44] The 2014 **Russian Military Doctrine makes plain that it should prepare to repel air and space attacks** and that Russia should see to the 'deployment and maintenance of strategic space area orbital groups of space devices that support the activities of the armed forces'.[45] The June 2020 basic principles of Russian nuclear deterrence echoes this by calling for the 'development and deployment of missile defence assets and strike systems in outer space'.[46] In August 2015, Russia created an Aerospace Force and there is evidence to suggest that Russia is already using ground-based electronic warfare capacities that are designed to spoof and jam satellites (e.g. Tirada-2 and Bylina-MM).[47] Furthermore, in July 2020 the US and United Kingdom (UK) claimed that Russia had tested an ASAT near a US government satellite in Low Earth Orbit (LEO).[48] This follows other reports that claim that Russia loitered around an American spy satellite in 2020.[49]

**Beijing is also a growing space power and it has politically invested in following 'a path of self-reliance and independent innovation'**.[50] China sees the development of a "Space Silk Road" as an important enabler of its wider Belt and Road Initiative (BRI). In 2016, China adopted a White Paper on space activities which underlined its ambition to explore and understand space and earth. Although the White Paper stressed the "peaceful ambitions" of China in space, its 2015 Military Strategy makes clear that it will 'deal with security threats and challenges' in space and 'secure its space assets'. Additionally, the military strategy makes clear that the People's Liberation Army Air Force (PLAAF) should move from territorial air defence to build 'an air-space defence force structure that can meet the requirements of informationised operations'.[51] In the mid-2010s, China created a PLA Strategic Support Force (PLASSF) and its Space Systems Department is reportedly developing advanced rocketry, space situational awareness, ISR and 'ballistic missile and kinetic space interceptor testing'.[52] China's space programme is directed by the State Council and the PLA[53], and there are reports that the PLA is rapidly developing its jamming and

[44] US Defense Intelligence Agency, "Russia Military Power: Building a Military to Support Great Power Aspirations", 2017, p. 35, https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications/Russia%20Military%20Power%20Report%202017.pdf?ver=2017-06-28-144235-937.

[45] Russian Federation, "Military Doctrine of the Russian Federation", 2014, https://www.offiziere.ch/wp-content/uploads-001/2015/08/Russia-s-2014-Military-Doctrine.pdf.

[46] Russian Federation, "Basic Principles of State Policy of the Russian Federation on Nuclear Deterrence", June 8, 2020, https://www.mid.ru/en/foreign_policy/international_safety/disarmament/-/asset_publisher/rp0fiUBmANaH/content/id/4152094.

[47] Bart Hendrickx, "Russia gears up for electronic warfare in space (part 1)", *The Space Review*, October 26, 2020, https://www.thespacereview.com/article/4056/1.

[48] "US accuses Russia of testing ani-satellite weapon in space", *Deutsche Welle*, July 23, 2020, https://www.dw.com/en/us-accuses-russia-of-testing-anti-satellite-weapon-in-space/a-54301195.

[49] Ann Finkbeiner, "How do we Prevent War in Space?", *Scientific American*, November 1, 2020, https://www.scientificamerican.com/article/how-do-we-prevent-war-in-space/.

[50] State Council of the People's Republic of China, "White Paper on China's Space Activities in 2016", China Daily, December 28, 2016, http://english.www.gov.cn/archive/white_paper/2016/12/28/content_281475527159496.htm.

[51] US Naval Institute, "Document: China's Military Strategy", May 26, 2015, https://news.usni.org/2015/05/26/document-chinas-military-strategy.

[52] Mark Stokes, Gabriel Alvarado, Emily Weinstein and Ian Easton, "China's Space and Counterspace Capabilities and Activities", Report prepared for the US-China Economic and Security Review Commission, p. 23, https://www.uscc.gov/sites/default/files/2020-05/China_Space_and_Counterspace_Activities.pdf.

[53] US Defense Intelligence Agency, "Challenges to Security in Space", January, 2019, p. 15, https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications%2FSpace_Threat_V14_020119_sm.pdf.

cyberdefence capabilities, directed energy weapons and ASAT.[54] In October 2020, China reportedly transported military signals intelligence satellites into orbit.[55]

### 2.3.2 Renewed space ambitions

**A range of space actors have recently embarked on enhancing their space exploration efforts**. This is a by-product of the space exploration race where countries compete with each other to showcase their overall technological prowess. For states like China and Russia, proving that they can independently access space is a symbol of how far they are catching up with US power. On 11 December 2017, President Donald Trump called on NASA to begin work on returning to the moon by 2024 as well as to take steps to commercialise LEO. Convening the National Space Council (NSC) for the first time since 1993[56,] President Trump has been keen to maintain America's lead in space exploration.[57] Although successive US administrations have sought to take America back to the moon and/or to Mars, the reality is that since the retirement of Space Shuttle in 2011 the US has had to rely on Russia to transport American astronauts to space and the ISS. This dependence has been noted by the Trump administration and has resulted in an increase in US space spending.[58]

**The US' recent steps to enhance its presence in space has to do with the continued rise of China**. Beijing – only the third country after the US and Russia (ex-Soviet Union) to have launched humans into space – has been to the moon and in January 2019 the Chang'e 4 mission landed a lunar spacecraft and rover on the far side of the moon. In July 2020, China launched an unmanned spacecraft and rover destined for the exploration of Mars and in November 2020 China independently launched a mission to collect moon rocks. Furthermore, China is developing its Beidou Navigation System and it is supposed to achieve global coverage in 2020 with a constellation of 35 satellites. In 2019, a total of 33 satellites were already operational.[59] Beijing has also made considerable progress with launcher technologies and its 'Long March' heavy-lift launchers continue to be developed with a view to enhancing fuel systems and payloads. Beijing can already rely on a range of earth observation and geostationary satellites used for communications and broadcasting. It should be noted that China is planning to establish its own independent space station called Tiangong by 2022.[60]

Like China, Russia is rapidly developing and modernising its global positioning system "Glonass". In October 2020, Russia launched a further Glonass K satellite as part of an existing constellation of 24 active satellites.[61] In terms of innovation, Russia is reported to be developing a next-generation satellite system

[54] US Department of Defense, "Military and Security Developments Involving the People's Republic of China 2020", Annual Report to Congress, August 21, 2020, p. 81, https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF.

[55] See Stephen Clark, "China Launches Three Military Spy Satellites", *Spaceflight Now*, October 26, 2020, https://spaceflightnow.com/2020/10/26/china-launches-three-military-spy-satellites/ and Rui C. Barbosa, "China Launches New Yaogan-30 Group of Military Satellites", NASA Spaceflight, October 26, 2020, https://www.nasaspaceflight.com/2020/10/china-launches-new-yaogan-30-group-of-military-satellites/.

[56] Neel V. Patel, "The five biggest effects Trump has had on the US space program", *MIT Technology Review*, October 26, 2020, https://www.technologyreview.com/2020/10/26/1011214/five-biggest-effects-trump-us-space-program-nasa-moon/.

[57] *Op.Cit*., "National Security Strategy of the United States of America", p. 31.

[58] Loren Thompson, "US Growing Dependent on Russia for Satellite Propulsion", *Forbes*, September 14, 2018, https://www.forbes.com/sites/lorenthompson/2018/09/14/u-s-satellite-makers-turn-to-foreign-sources-for-in-space-propulsion-despite-buy-american-push/?sh=1a377fe61590.

[59] Alexander Bowe, "China's Pursuit of Space Power Status and Implications for the United States", Staff Research Report for the US-China Economic and Security Review Commission, April 11, 2019, p. 3, https://www.uscc.gov/sites/default/files/Research/USCC_China's%20Space%20Power%20Goals.pdf.

[60] Leonard David, "China Selects 18 New Astronauts in Preparation for Space Station Launch", *Space.com*, October 8, 2020, https://www.space.com/china-selects-new-astronauts-for-space-station.

[61] Stephen Clark, "Russia launches Glonass Navigation Satellite", *Space Flight*, October 26, 2020, https://spaceflightnow.com/2020/10/26/russia-launches-glonass-navigation-satellite/.

called Sfera with a 2022 planned roll-out. The Sfera programme is reported to be a cluster of 600 or more satellites designed to develop broadband Internet and communications.[62] Moscow is also seeking to capitalise on advances such as reusable rockets and the Roscosmos State Corporation (RSC) has announced that it plans to develop a new Amur reusable rocket designed to reduce the costs of space flight.[63] Given Russia's successful history of space launches and exploration, **Moscow views its continued ability to remain on the cutting edge of space technology as a matter of national pride**. This is in-line with the aims of its 2015 National Security Strategy.[64]

**Countries such as India and Japan are also investing political and financial energy into space**. India is currently working on its 'Spacecom Policy 2020', which underlines how India should 'achieve self-reliance and bring in necessary capabilities within the country at par with global trends'. To this end, India is seeking to send its first human space flight into orbit by 2022 and the country has already successfully undertaken 109 spacecraft missions to enhance its communications and imagery capabilities and to develop its regional Navigation Satellite System (NavIC).[65] Japan undertook an overhaul of its space sector in the early 2000s with the creation of the Japan Aerospace Exploration Agency (JAXA). From the 1960s onwards, Japan has developed its space sector by drawing on its relative strength in high-technology and robotics (e.g. in 2013 it was the first nation to deploy a robot to space).[66] More recently, Japan has continued to develop its own regional PNT system called the Quasi-Zenith Satellite System (QZSS).

### 2.3.3 Congestion in space

One of the other trends that is gaining a lot of publicity is the growing commercialisation of space. This denotes the rise of commercial space firms, the growth of venture capital and private capital investments, satellite miniaturisation and reusable launchers. **Today, space is depicted as a playground for investors and innovators** such as Elon Musk but the reality is that public institutions remain vital to the space sector. As one report by the OECD makes clear, '[t]he lion's share of initial investments in launchers, satellites and other space-related infrastructure is made by governments'.[67] Nevertheless, **governments have understood that new entrants in the space sector have the potential to create long-term disruption**.[68] The rise of private actors has occurred in a context were the US Federal Government has decreased investments in NASA since the 1990s, and NASA increasingly relies on private actors for space travel. In May 2020, NASA astronauts travelled to the ISS onboard a SpaceX Falcon 9 rocket[69] and the

[62] "First Six Satellites under Sfera Program to be Launched in Three Years", *Space Watch Global*, June 7, 2018, https://spacewatch.global/2018/06/first-six-satellites-under-sfera-program-to-be-launched-in-three-years/ and Anatoly Zak, "Russian Military and Dual-Purposes Spacecraft: Latest Status and Operational Overview", *CNA Occasional Paper*, June, 2019, p. 25, https://www.cna.org/CNA_files/PDF/IOP-2019-U-020191-Final.pdf.

[63] Eric Berger, "Russian space corporation unveils planned 'Amur' rocket – and it looks familiar", *Ars Technica*, June 10, 2020, https://arstechnica.com/science/2020/10/russian-space-corporation-unveils-planned-amur-rocket-and-it-looks-familiar/.

[64] Russian Federal Government, "Russian National Security Strategy", Full-text translation, December, 2015, http://www.ieee.es/Galerias/fichero/OtrasPublicaciones/Internacional/2016/Russian-National-Security-Strategy-31Dec2015.pdf.

[65] Indian Space Research Organisation, "Missions", November, 2020, https://www.isro.gov.in/missions.

[66] Daisuke Akimoto, "The Evolution of Japan's Space Strategy: It's Dual-Use Nature and Implications for the Japan-US Alliance", *Institute for Security and Development Policy Voices,* July 13, 2020, https://isdp.eu/evolution-japan-space-strategy-dual-use-nature-and-implications-for-japan-us-alliance/ and Paul Kallender, "Japan's New Dual-Use Space Policy: The Long Road to the 21st Century", *Notes de l'Ifri Asie Visions*, no. 88, IFRI Center for Asian Studies, November, 2016, https://www.ifri.org/sites/default/files/atoms/files/japan_space_policy_kallender.pdf.

[67] Organisation for Economic Cooperation and Development, "Measuring the Economic Impact of the Space Sector: Key Indicators and Options to Improve Data", October 7, 2020, p. 3, https://www.oecd.org/innovation/inno/measuring-economic-impact-space-sector.pdf.

[68] Gil Denis *et al*., "From New Space to Big Space: How Commercial Space Dream is Becoming a Reality", *Acta Astronautica*, vol. 166, January, 2020, pp. 431-443.

[69] Steven J. Markovich, Andrew Chatzky and Anshu Siripurapu, "Space Exploration and U.S. Competitiveness", Council on Foreign Relations, June 10, 2020, https://www.cfr.org/backgrounder/space-exploration-and-us-competitiveness.

Agency estimates that this type of relationship could help it save some $20-$30 billion under its Commercial Crew Programme.[70]

**China announced in October 2020 that it plans for a rapid expansion of commercial space activities from 2020 to 2025**.[71] To this end, in December 2019, a group of space companies joined forces under the China Commercial Space Alliance (CCSA) to bring together private and state-owned space and defence companies.[72] Harnessing the commercial sector in this way has already seen a proliferation of launcher companies. Some estimates claim that there are currently 78 commercial space companies located in China, with 29 focusing on satellite manufacturing, 21 on launchers, 8 on remote sensing, 17 on communications and the remaining 3 on ground stations, data analytics and other services.[73] What is more, China is keen to develop commercial space launches and to enhance research on the reuse of launch vehicles. Building on its Kuaizhou series of rockets, Beijing wants to develop a reusable spaceplane called Tengyun by 2025.

Finally, rising space powers such as Russia, India and Japan have also staked a lot on commercial actors. For example, in 2016, Russia created the RSC in order to spearhead the country's modernisation of space capacities and to support Russian start-ups seeking to enter the space sector. The Indian government clearly recognise that they should support venture capital and start-ups in the space sector, and that it needs to ensure the protection of India's space assets by working with indigenous firms.[74] The Japanese government stated in its 2020 Basic Plan for Space that it seeks to invest in the space sector in order to ensure that Japan does not fall behind the technology curve, especially given the growing number of threats to satellites in outer space.[75] Today, **Japan is a centre for over 40 innovative space start-ups** that specialise in space exploration, space robotics and space debris.[76]

# 3 The EU as an autonomous space actor

Now that a definition of strategic autonomy in space has been provided, and before looking at areas where the EU is still lagging behind, this chapter focuses on the ways in which it has attained a level of strategic autonomy in space. In this respect, we will see how the EU fares when it comes to the three forms of strategic autonomy outlined in the previous chapter. It should be said that **the European space sector is an essential feature of the EU** economy and its strategic autonomy. Europe can already boast to being a leader in space exploration with the Rosetta and BepiColombo programmes showing that the continent has the technological means for critical space missions. It is also true that Europe is developing next

[70] Michael Sheetz, "NASA estimates having SpaceX and Boeing build spacecraft for astronauts saved €20 billion to €30 billion", *CNBC*, May 13, 2020, https://www.cnbc.com/2020/05/13/nasa-estimates-having-spacex-and-boeing-build-spacecraft-for-astronauts-saved-up-to-30-billion.html.

[71] Andrew Jones, "China's CASIC Reveals Five-Year Plan for Reusable Spaceplane, Commercial Space Projects", *Space News*, October 19, 2020, https://spacenews.com/chinas-casic-reveals-five-year-plan-for-reusable-space-plane-commercial-space-projects/.

[72] Andrew Jones, "China Creates Commercial Space Alliance, Expands Launch Complex", *Space News*, December 20, 2019, https://spacenews.com/china-creates-commercial-space-alliance-expands-launch-complex/?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axiosspace&stream=science.

[73] Irina Liu *et al*., "Evaluation of China's Commercial Space Sector", *Science and Technology Policy Institute*, September, 2019, p. iv, https://www.ida.org/-/media/feature/publications/e/ev/evaluation-of-chinas-commercial-space-sector/d-10873.ashx?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axiosspace&stream=science.

[74] Government of India, "Spacecom Policy - 2020", October 15, 2020, p. 2, https://www.isro.gov.in/sites/default/files/draft_spacecom_policy_2020.pdf.

[75] Japan National Space Policy Secretariat, "Outline of the Basic Plan on Space Policy (Provisional Translation)", June 30, 2020, https://www8.cao.go.jp/space/english/basicplan/2020/abstract_0701.pdf.

[76] Rachel Jewett, "Japan's Space Startup Market Blooms", *Via Satellite Digital*, November, 2020, http://interactive.satellitetoday.com/via/november-2020/japans-space-startup-market-blooms/.

generation launch capabilities such as Ariane 6 and Vega C77, which should reduce the cost of space launches while offering more attractive payload set-ups and shorter lead times for production. It should also be noted that a number of European launcher and satellite companies are genuinely transnational and bring together leading space companies from across Europe.

## 3.1 "European" or "EU" strategic autonomy?

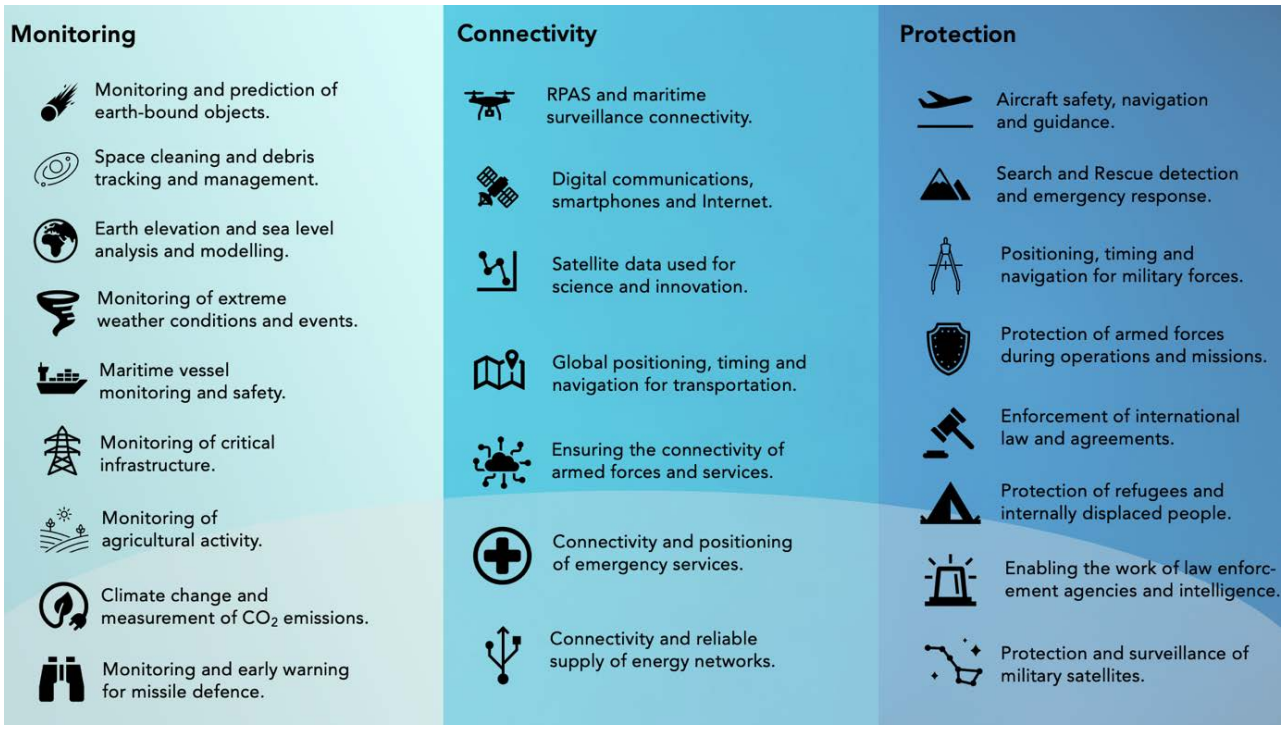
It is important to make a distinction between "Europe's" space efforts and the "EU's" specific capabilities and programmes in the context of any debate about strategic autonomy. From a technical point of view the EU's core space capabilities Galileo, EGNOS and Copernicus are European programmes because they rely on EU and member state funding and the technical expertise of non-EU bodies such as the ESA and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT). This poses a point of reflection of what is actually meant by "strategic autonomy" and "Europe" when discussing space. For example, while it is true that the EU is one of the major public institutions financing the space sector, it relies on the technical expertise of bodies such as national space agencies, the ESA and EUMETSAT to technically develop launch and satellite technologies and these bodies in turn work with industrial and research partners across Europe. **Space cooperation in Europe therefore represents a mix of supranational and intergovernmental actors and structures**.[78]

Together, Galileo, EGNOS and Copernicus offer the EU a high level of strategic autonomy as it allows it to observe earth, protect transport networks, sustain digital networks and the security of trade routes and much more. While Galileo, EGNOS and Copernicus do not yet fully cover all of the tasks illustrated in Figure 4, the future applications provided by these programmes is potentially far reaching.

[77] ASD-Eurospace, "Industry Manifesto for a Resilient Satellite System for Secure Connectivity to Make Europe Fit for the Digital Age", October, 2020, p. 7, https://eurospace.org/industry-manifesto-for-a-resilient-satellite-system-for-secure-connectivity-to-make-europe-fit-for-the-digital-age/.

[78] Lucia Marta and Paul Stephenson, "Role of the European Commission in Framing European Space Policy", in Thomas Hörber and Paul Stephenson, *European Space Policy: European Integration and the Final Frontier* (London/New York: Routledge, 2016), pp. 98-113.

**Figure 4:** A non-exhaustive list of the uses of space




*Visual design: EU Institute for Security Studies, 2020*

## 3.2 Galileo as a symbol of EU strategic autonomy

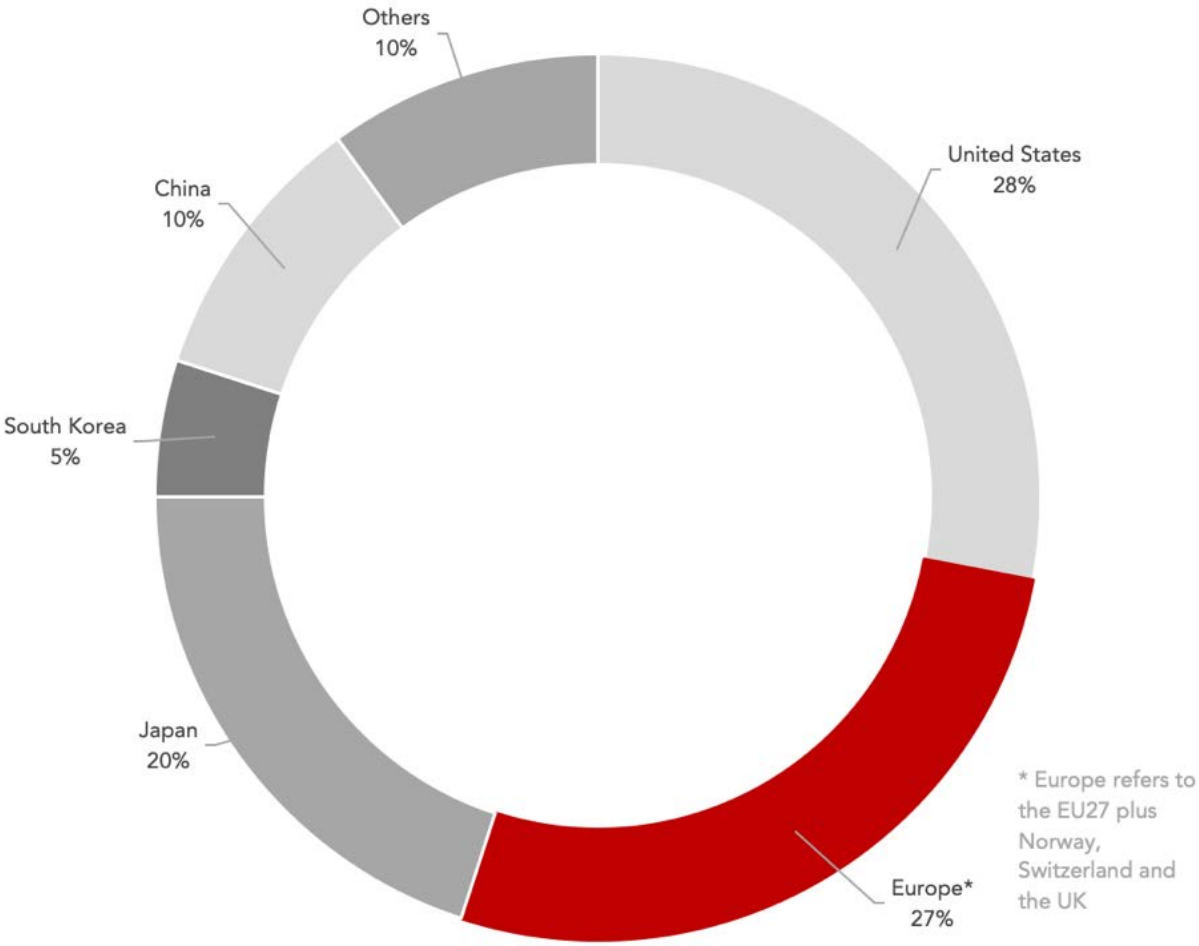
In many respects, **Galileo has become a key symbol of the EU's ability to combine a quest for strategic autonomy**.[79] A strategically autonomous actor is one that can design, develop, launch and operate space systems without hindrance. Accordingly, Galileo provides for four specific functions: 1) the open service (OS), which is a free and open service positioning and timing service; 2) a commercial high accuracy service (HAS), that provides for an enhanced navigation service that can be encrypted depending on customer needs; 3) a Search and Rescue (SAR) service that contributes to responding to distress signals; and 4) the PRS service that is available to authorised government users for sensitive applications. Galileo involves approximately 150 institutional and industrial partners and it is unique among global positioning systems because, unlike the US' Global Positioning System (GPS) and Russia's Glonass systems, it is a civil rather than military-user led programme. Additionally, even though the European Global Navigation Satellite System (GNSS) Agency mainly works to improve Galileo's services and infrastructure, it also ensures security accreditation and safe use of the system – providing another layer of security for users.

The European and international uptake of Galileo is truly impressive given that the programme is only just over 20 years old, and today over 350 different smartphone devices are Galileo-compatible and more than 30 companies across the world produce Galileo-enabled chips.[80] Furthermore, on the back of Galileo Europe's share of the global GNSS market is increasing and the gap to the US is closing. The ESA calculates that if one looks at total industry revenues from the global GNSS market in 2019, Europe is close on the heels of the US and in front of countries such as China, Japan and South Korea (see Figure 5).[81] In order to

[79] Jean-Pierre Darnis, "European Technological Sovereignty? A Response to the COVID-19 Crisis?", Note de la FRS, no. 45, May 29, 2020, https://www.frstrategie.org/en/publications/notes/european-technological-sovereignty-response-covid-19-crisis-2020.
[80] See: https://usegalileo.eu/EN/.
[81] Europe GSA Agency, "GSA GNSS Market Report", Issue 6, 2019, p. 12, https://www.gsa.europa.eu/system/files/reports/market_report_issue_6_v2.pdf.

maintain this positive trend, the EU should continue to promote GNSS through its policies and diplomatic efforts as well as ensure that it remains as a technological vanguard in the global GNSS market.

**Figure 5:** Global GNSS market: share of total industry revenues, 2019




*Data: European Global Navigation Satellite Systems Agency, 2019*

Furthermore, **Galileo promises future services that will be crucial from the perspective of security and defence**. In fact, the combination of Galileo's Public Regulated Service (PRS) and high PNT accuracy means that a host of public bodies and governments in the EU will be able to rely on a highly accurate and encrypted public service. In interviews conducted for this study, the security and defence potential of Galileo was underlined numerous times. In particular, respondents argued that the specific high-level of accuracy of Galileo would be crucial for the conduct of missions and operations under the CSDP. PNT is extremely important to armed forces because even a half second error in timing can result in vehicles and weapons systems being kilometres off target. Without accurate PNT capabilities, for example, tasks such as air-to-air refuelling become extremely difficult because the refuelling craft and fighter plane could have different timing sequences. Likewise, accurate timing is a precondition for maintenance and repair and onboard computers in fighter or strategic transport aircraft cannot be correctly calibrated if PNT is not precise. Finally, **Galileo's most attractive feature is that it is an independent EU capability that could provide Europe's armed forces with the freedom of movement during operations and missions** without being dependent on third state global positioning and navigation systems. In this respect, it is

essential to ensure that Galileo relies on secure components, technologies and systems and that the industrial supply chain is resilient.

### 3.2.1 Galileo and political autonomy

Yet, Galileo does not just provide for strategic autonomy because of its functions as its governance structures also offer the EU autonomy from external contingencies. First, it is important to recall that Galileo has been successful thus far because it has been based on a clear vision developed and supported by EU institutions. **Under Galileo there is no drive to ensure that each EU member state gets a slice of the programme budget**, and instead the Commission ensures that the programme delivers for all member states. Decisions under Galileo are, therefore, not subject to a national veto and this gives the EU as a supranational actor a measure of decision-making discretion. Although the Commission is dependent on the technical expertise of bodies such as ESA (which includes non-EU member states such as Norway, Switzerland and the UK), it seeks to protect the EU's essential security interests within such entities. For example, the proposed Regulation on the EUSP states clearly that because the ESA is not an EU body or subject to EU law 'it is essential, in order to protect the interests of the Union and its Member States'.[82] Similar arrangements exist for Copernicus, which is not a purely EU programme and relies on co-funding from the EU, ESA, EU member states and EUMETSAT.[83]

Such security arrangements take on a different meaning in the context of "Brexit". Since its departure from the EU, the UK has lost access to Galileo's encrypted PRS. An initial plan to develop a UK sovereign positioning and navigation system that would be independent from Galileo and GPS appears to have fallen through due to cost considerations. At present, the UK are said to be experimenting with technological alternatives that do not deploy in MEO like Galileo. In the meantime, there have been suggestions that the UK government could utilise the services of OneWeb, although this satellite constellation provides communications rather than navigation services. Brexit has already resulted in Galileo ground installations being removed from UK territory (i.e. this includes the transfer of the Galileo Security Monitoring Centre back-up site to Spain and the removal of sensor stations from the Falkland and Ascension Islands).[84]

In essence, the EU has to ensure that critical Galileo functions such as PRS can be maintained. While negotiations on the future partnerships between the EU and UK are still ongoing, it has already been stated in the political declaration setting out the framework for the future relationship between the two parties that they should consider appropriate arrangements for cooperation on space. Indeed, the political declaration deals with the terms and conditions for the UK's potential participation in Union programmes and it already flags possible cooperation and exchange on intelligence and sensitive information in areas such as space-based imagery.[85] As far as Galileo PRS is concerned, the proposed Regulation for the EUPS makes clear that access to the system by third countries or international organisations is covered by Article

[82] See Recital 29, European Commission, "Regulation Establishing the Space Programme of the Union and the European Union agency for the Space Programme", *COM(2018) 447 final*, Brussels, June 6, 2018, https://eur-lex.europa.eu/resource.html?uri=cellar:33f7d93e-6af6-11e8-9483-01aa75ed71a1.0003.03/DOC_1&format=PDF.

[83] See Recital 54 of European Commission, "Regulation Establishing the Copernicus Programme and Repealing Regulation (EU) No 911/2010", *Regulation 377/2014*, April 3, 2014, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0377&from=EN and Recital 6 of European Commission, "Implementing Decision on the Technical Specifications for the Copernicus Space Component Pursuant to Regulation (EU) No 377/2014 of the European Parliament and of the Council", *Decision 2018/621*, April 20, 2018, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018D0621&from=EN.

[84] European Commission, "Daily News 25/03/2019", March 25, 2019, https://ec.europa.eu/commission/presscorner/detail/en/MEX_19_1830.

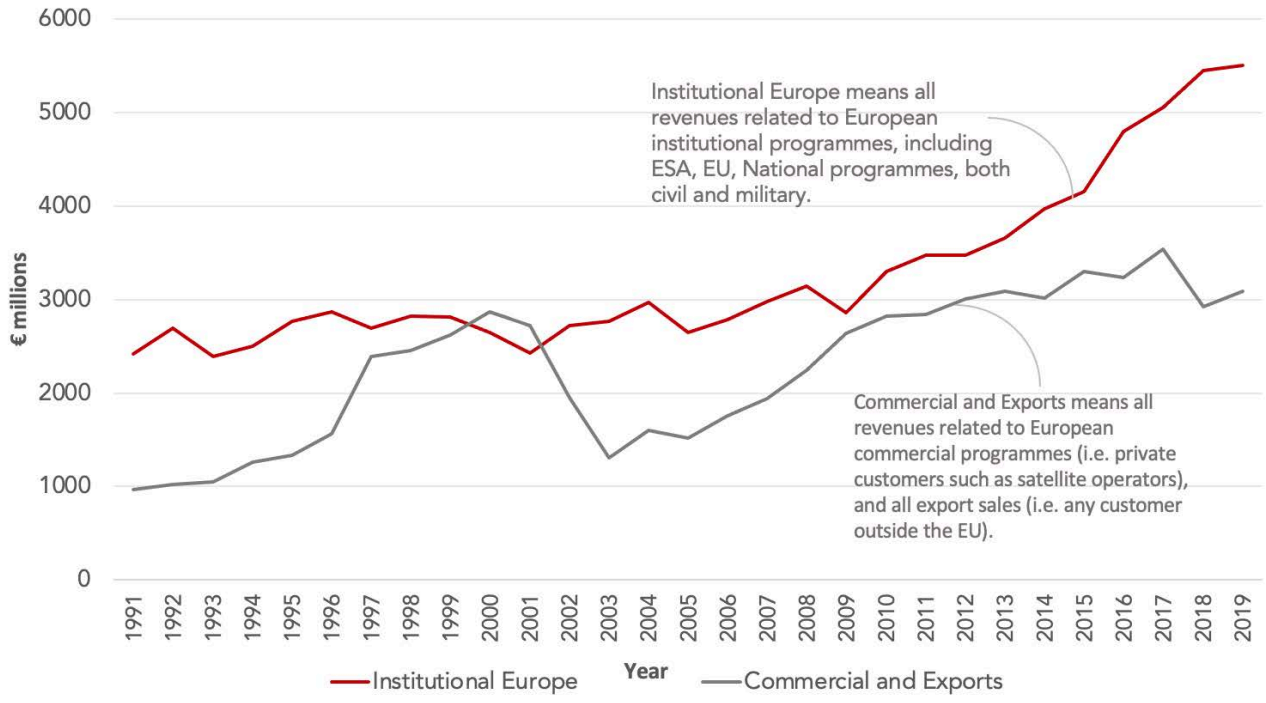
[85] European Commission, "Revised text of the Political Declaration setting out the framework for the future relationship between the EU and the UK", October 17, 2019, https://ec.europa.eu/commission/sites/beta-political/files/revised_political_declaration.pdf.

3.4 of Decision 1104/2011/EU on the rules for access to the PRS, which permits participation so long as appropriate security of information agreements and terms and conditions are put in place.[86]

Of course, one challenge posed by Brexit is the maintenance of secure supply chains for Galileo and the UK's future participation in EU-funded space endeavours. The UK has stopped being a member state of the EU but it is still a member of ESA, and the Agency in turn is part of Galileo and other programmes. Given that the Union contributes a third of the ESA's overall budget there is a question of how far UK industry (as third state entities) should benefit from EU investments that support ESA programmes.[87] While the future EU-UK relationship is subject to continued negotiations there are industrial and security considerations that relate to programmes such as Galileo, especially if the EU does not want to become too dependent on third states.

Based on the above, the Galileo programme meets many of the facets of strategic autonomy elaborated in the previous chapter. Accordingly, the programme clearly denotes the EU's collective willingness to enhance its strategic autonomy in space and there is a broad political consensus on the need to keep investing in Galileo (*autonomy for*). The programme also represents the EU's ability to take autonomous decisions and to rely on a technological system that caters to the EU's essential security interests. In the past, the programme has relied on the supply of both financial resources and material capacities and despite a reduction of funding under the next MFF for the EUSP, billions of euros are being dedicated to this flagship project (*autonomy to*). However, strategic autonomy is a political force that can be lost as quickly as it was gained. Looking to the future, **Galileo and European space more broadly face a number of challenges that if not correctly addressed can lead to an erosion of capacity and political freedom** (*autonomy to* and *autonomy from*).

**Figure 6:** Sales by main customer segment (€ millions)




*Data: Copyright by Eurospace – used with permission – reproduction forbidden*

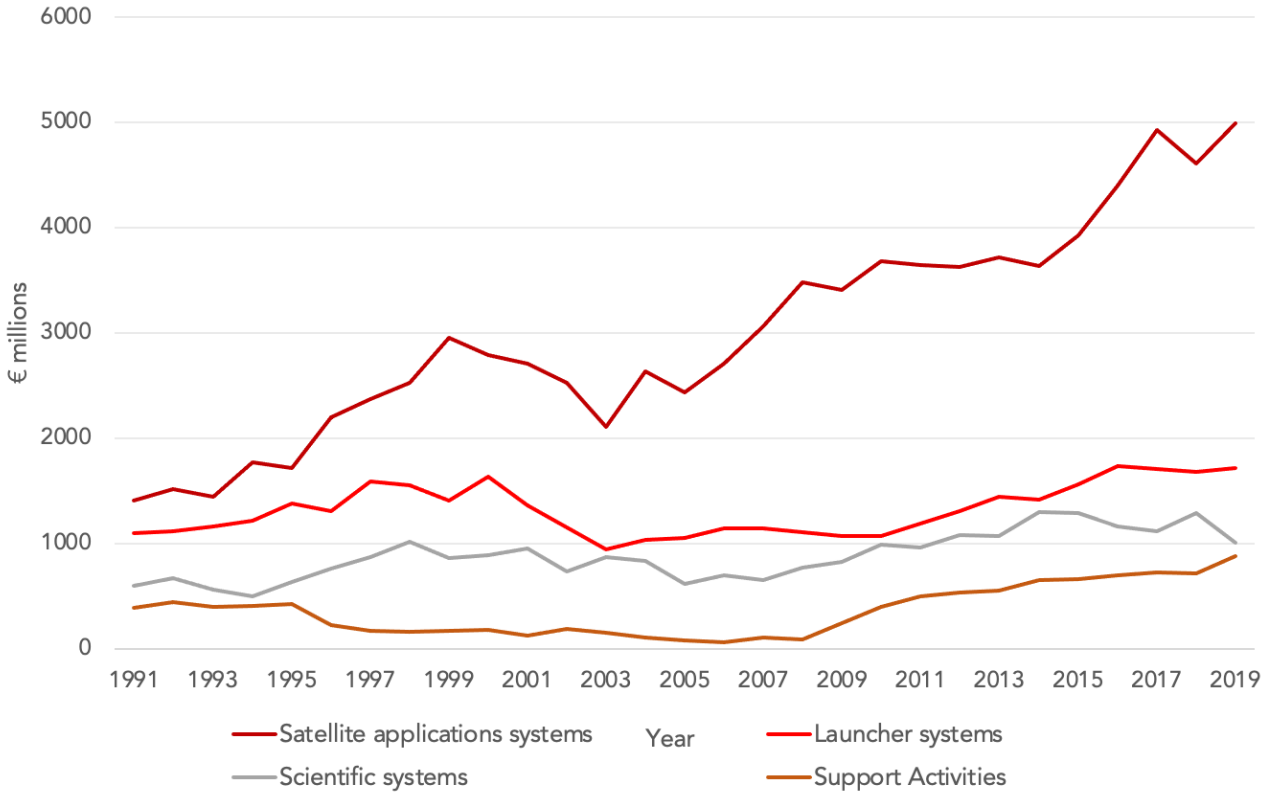
[86] See *Op.Cit*, Article 8.2. in *COM(2018) 447 final* and European Commission, "Decision on the rules for access to the public regulated service provided by the global navigation satellite system established under the Galileo programme", Decision 1104/2011/EU, October 25, 2011, https://www.gsa.europa.eu/sites/default/files/decision_no_1104-2011-eu_on_the_rules_for_access_to_the_public_regulated_service_provided_by_the_global_navigation_satellite.pdf.

[87] "Brexit and Space", *ESPI Briefs*, no. 24, July, 2018.

## 3.3 The space market and Covid-19

In order to ensure the continued relevance of Galileo in the future, it will be increasingly important to plan for the next-generation of the system. In particular, the EU must ensure that it does not lose technological ground to the US, China and Russia which are all modernising their global positioning variants. Fortunately, this need is already recognised by the EU and **the integration of cutting-edge technologies in future phases of Galileo is a core feature of the programme's evolution**. As the proposed Regulation on the EUSP underlines, 'not only should the continuity of [space] initiatives be ensured but they must also be improved, so that they remain at the forefront in view of new technology development and the transformations in the digital and information and communications technology domains'.[88] Beyond technological development, however, there are wider issues such as the need to ensure critical security of supply for space components and technologies and to safeguard EU space systems from extra-territorial regulations that could hinder technology development and transfers in the EU (more on this later).

**Figure 7:** Sales by main product segment (€ millions)




*Data: Copyright by Eurospace – used with permission – reproduction forbidden*

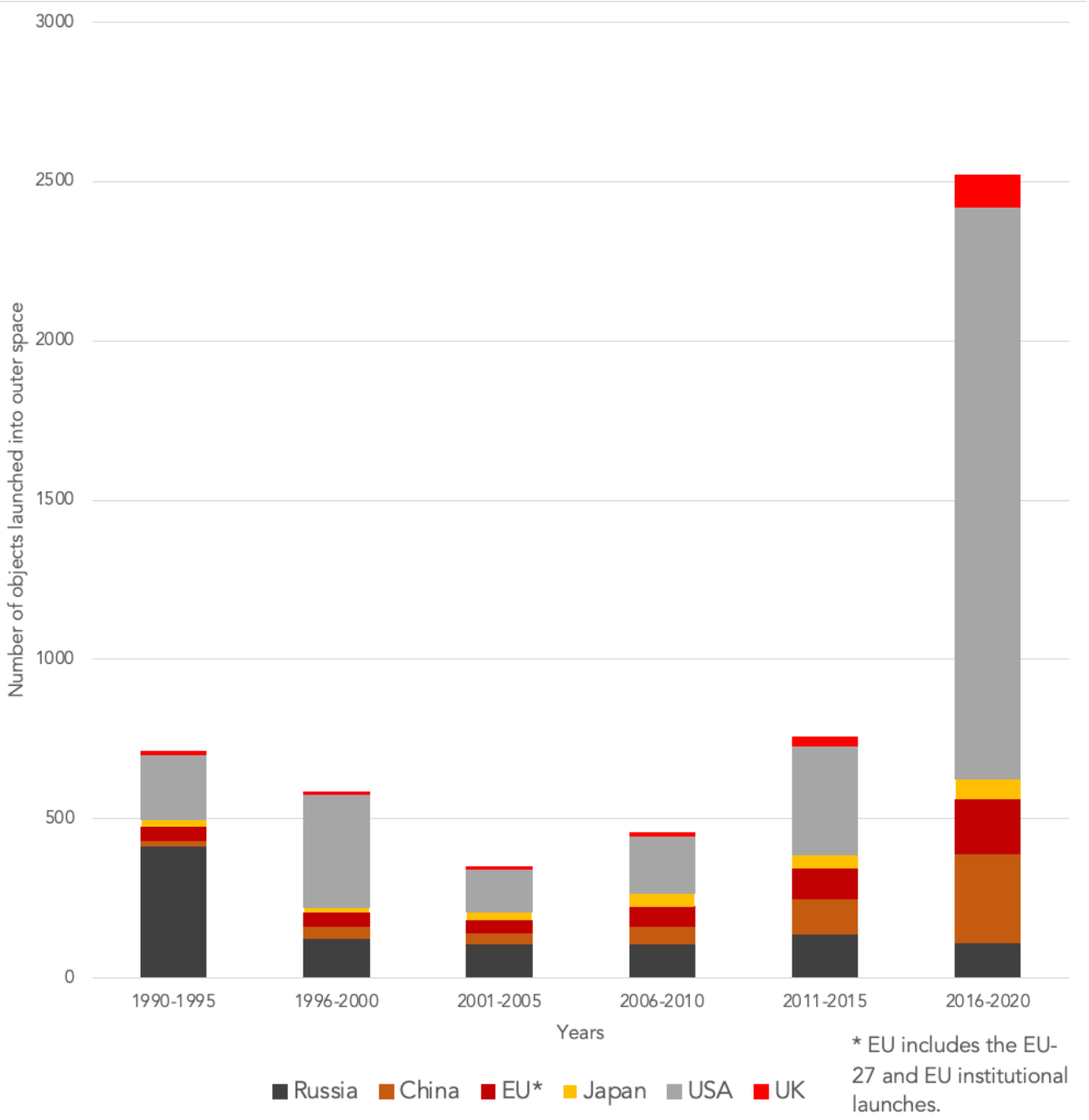
Beyond Galileo, however, there is a need to look at Europe's space sector in a more comprehensive manner and to recognise some of the challenges facing the industry. This is especially important given the specificities of the space sector: programmes are capital intensive and they rely on a high-level of technology integration and expertise. In 2019, **the European space sector employed more than 50,000**

[88] See Recital 3, European Commission, "Regulation Establishing the Space Programme of the Union and the European Union agency for the Space Programme", *COM(2018) 447 final*, Brussels, June 6, 2018, https://eur-lex.europa.eu/resource.html?uri=cellar:33f7d93e-6af6-11e8-9483-01aa75ed71a1.0003.03/DOC_1&format=PDF.

**individuals** and **the space industry in Europe generated more than €8.7 billion** in final sales (including €1.712 billion for launcher systems and €4.171 billion for satellite application systems).[89] Yet, the European space sector faces uncertainties because of the Covid-19 pandemic. Indeed, industry have already flagged that any under-investment in the space sector due to the pandemic would have severe consequences for Europe's space technology and industrial base, as well as adversely affect skilled human capital and potentially disrupt supply chains.[90] Such concerns have been echoed elsewhere too, and there is a recognition that the space sector performs an important role in managing the virus as well as being an indispensable part of the EU economy.[91]

[89] For all data in this paragraph see ASD-Eurospace, "Eurospace Facts and Figures – Key 2019 Facts", p. 11, https://eurospace.org/wp-content/uploads/2020/07/press-release-ff-2020-final-july-23.pdf.
[90] ASD-Eurospace, "Mitigating the Impact of the Pandemic on the European Space Industry", April 24, 2020, https://eurospace.org/wp-content/uploads/2020/04/eurospace-pp-on-covid19_final.pdf.
[91] European Space Policy Institute, "COVID-19 and the European Space Sector", *ESPI Special Report*, July, 2020, https://espi.or.at/news/new-espi-special-report-on-covid-19-and-the-european-space-sector.

**Figure 8:** Number of objects launched into outer space, 1990-2020




*Data: United Nations Office for Outer Space Affairs, 2020*

Ultimately, it all comes down to political ambition: either the EU will simply be content with maintaining existing programmes or it will launch ambitious projects (internet satellite constellations, quantum communications or landing on the Moon[92]). In this context, it should be understood that revenues from institutional actors in Europe represent the main sales segment for the European space sector and increasingly so (even consistently outmatching commercial and exports sales) (see Figure 6 and Figure 7 above).

[92] This is the interesting conclusion of one study that calls for Europeans to have a permanent presence on the Moon by 2040. See: Juha-Matti Liukkonen, Arthur Sauzay and Sebastian Straube, "Space: Will Europe Awaken?", *Institut Montaigne Policy Paper*, February, 2020, p. 34, https://www.institutmontaigne.org/ressources/pdfs/publications/espace-le-reveil-de-leurope-note-EN.pdf.

### 3.3.1 Europe's space sector as a launch pad

While Covid-19 is a challenge for the space sector in Europe, there are broader structural challenges including Europe's ability to increase the number of launches and to create a market place where demand is consistent and costs can be managed. Europe is falling behind the US, China, Russia and other players in terms of institutional launches and this has an impact on the wider sector, not to mention raising questions for Europe's strategic autonomy (see Figure 8). **Being dependent on third states for launch capabilities is not the hallmark of a strategically autonomous space actor**, and without investments in launch technology demand will remain low. In this sense, the EU's broader strategic autonomy in space is dependent on Europe's ability to reduce the costs of core technologies such as launchers and satellites, invest in high-technology components and systems and ensure that security of supply can be achieved among EU member states. Furthermore, without a consistent level of investment in the space sector, start-up and Small and Medium-sized Enterprises (SME) innovations developed in the EU may never make it past the prototyping phase. Prolonged investment in a sector known for long lead times for development is vital.

# 4 Advancing EU autonomy in space

In the last chapter we focused on areas in which the EU had advanced its strategic autonomy in space, but it also started to detail some of the challenges facing the EU's ability to maintain and extend its autonomy in space in the future. In this chapter we analyse further some of the key areas that the EU needs to focus on in the future. As we have seen, **space is too important to neglect from a security and defence perspective and it is a sector experiencing momentous technological shifts**. We have so far stressed the importance of continued investment in the European space sector, but it is equally necessary to spell out the key areas where the EU needs to focus in the coming years. In particular, industrial competition will be intense but a comprehensive EU approach to space is required that grapples with issues such as connectivity, technological developments, critical infrastructure protection and security and defence.

## 4.1 Promoting space and connectivity

One of the aspects of space that is becoming increasingly obvious is its role in promoting the EU's "digital sovereignty". Today, the EU is concerned with the digitalisation of its economy and this implies the integration of a range of economic sectors and technologies.[93] Yet there is a need to understand how space can facilitate a wider EU connectivity strategy. As one example shows, the drive to ensure complete satellite broadband coverage across the EU, lay the foundations for 6G and accrue the benefits of the Internet of Things (IoT) demands close collaboration between the space and telecommunications sectors. European Commissioner Thierry Breton has already floated the idea of developing a global constellation of satellites that could help the EU move from data collection from space to data processing.[94] **A flagship EU programme focused on developing a "connectivity constellation" would lower its dependence** on third states and allow it to collect and process data without fear of external interference. In this sense, any flagship project of this nature would require a strong underlying security logic that protects signals, data transfers and communications links.

The same underlying logic that saw Galileo take off could advance the EU's broadband satellite ambitions. At present, public and private companies in China and the US are moving at some speed to develop LEO and Medium Earth Orbit (MEO) internet global coverage constellation programmes. **The EU cannot fall**

[93] European Commission, "A New Industrial Strategy for Europe", *COM(2020) 102 final*, Brussels, March 10, 2020, p. 8, https://ec.europa.eu/info/sites/info/files/communication-eu-industrial-strategy-march-2020_en.pdf.
[94] "Internet haut debit: l'Europe souhaite developper sa propre constellation de satellites", *Sud Ouest International*, July 2, 2020, https://www.sudouest.fr/2020/07/02/internet-haut-debit-l-europe-souhaite-developper-sa-propre-constellation-de-satellites-7620981-4803.php.

**behind in this domain as any market lead by China and the US will potentially damage the EU's autonomy in space and in the digital domain**, with growing dependencies on constellation systems not owned by EU private actors or public authorities. It would be a strategic error to not seize on the potential of satellite broadband, and it would to some degree echo (and even address) similar security concerns related to non-EU 5G networks and providers that are linked too closely to third states authorities and potential political disruption. Even here there would be a security and defence dimension, as EU armed forces would benefit from having secure blanket broadband coverage for operations and missions. Reliance on a third state system would only increase the risk of internet blackouts, which would be potentially hazardous for EU armed forces.

### 4.1.1 Learning from Galileo

Accordingly, greater EU connectivity and digitalisation rests on political ambition and investment, but initiatives below the public radar can have an important effect on connecting space with the EU economy. Firstly, it is important to **scope out how each EU policy area would benefit from greater space-enabled connectivity**. Learning from the early experiences of Galileo, more should have been done to mandate EU institutions and services to use the global positioning and navigation system in their areas of work. In this regard, an important lesson has been learned during the pandemic as the EU's response to Covid-19 has relied on Galileo to ensure the proper functioning of the "Green Lane" initiative which ensures the free passage of freight transportation across borders (e.g. there is a Galileo Green Lane app). Copernicus has also been used by EU institutions to monitor air pollution during the pandemic. Consequently, no ambitious EU connectivity initiative can succeed without comprehensive public outreach that explains to citizens the benefits of space. **Connectivity will increasingly be an important feature of the EU's diplomacy in regions such as Asia**.[95]

Connectivity will rely on greater symbiosis between policy sectors. **One set of sectors that can be synergised to ensure greater connectivity are the civil, space and defence domains**. Not only would a connection between these policy areas stimulate the integration of dual-use technologies into space development programmes, but it could lead to greater technology transfers between space and defence. Of course, such a step will not be challenge free and in fact it is difficult to create technology commonalities between space and defence at the higher readiness levels of technology (TRLs). What is required instead is a focus on lower TRLs to ensure cost reductions and greater technology diffusion, and to avoid a misalignment of civil, space and defence Intellectual Property Rights (IPRs).[96] This is specifically critical for the space sector, which has 'very low production volumes' but high capital intensity and start-up technology costs.[97] In essence, therefore, **connectivity is about connecting policy domains, space and terrestrial technologies and R&D processes**.

[95] Even though the EU's Strategy for Connecting Europe and Asia does not specifically mention space, it will be a crucial enabler of the EU's digital partnership with Asia. See: European Commission/HRVP, "Joint Communication – Connecting Europe and Asia – Building Blocks for an EU Strategy", *JOIN(2018) 31 final*, Brussels, September 19, 2018, https://eeas.europa.eu/sites/eeas/files/joint_communication_-_connecting_europe_and_asia_-_building_blocks_for_an_eu_strategy_2018-09-19.pdf.

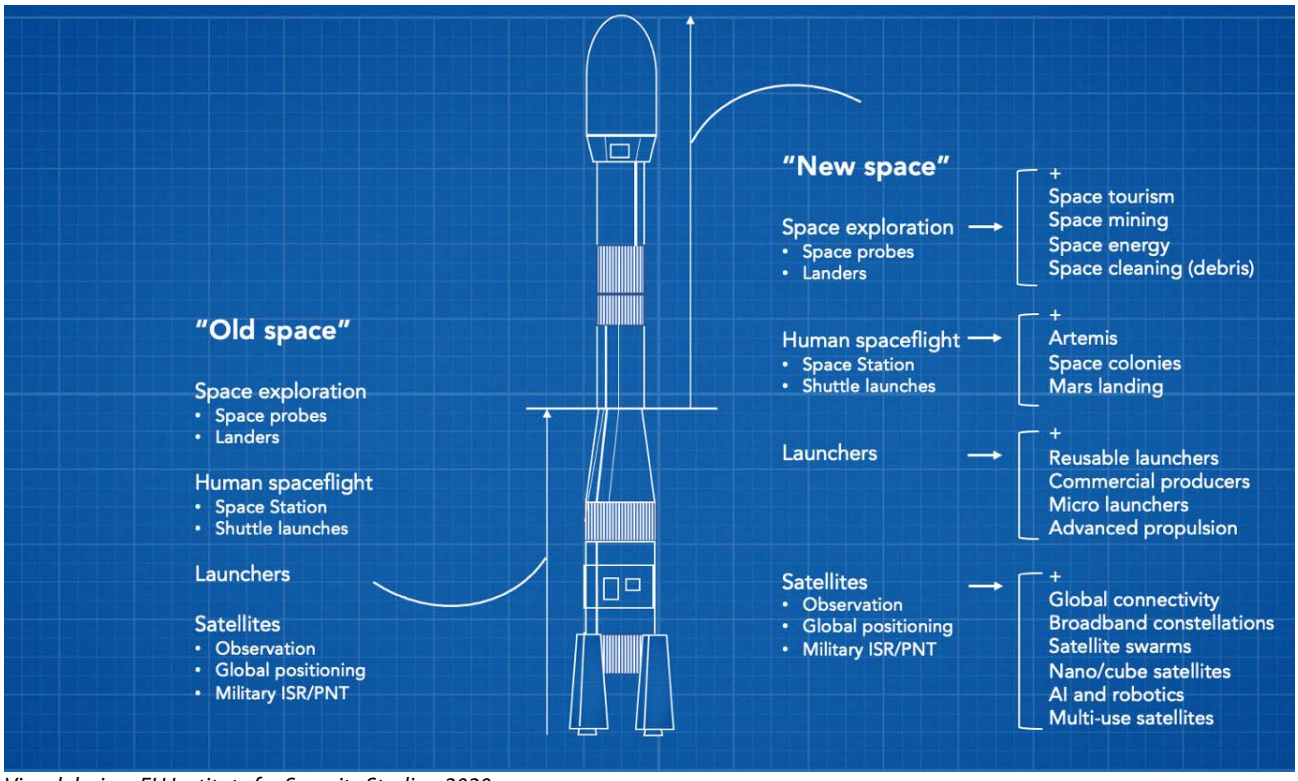
[96] European Commission, "Optimising Access to Dual-Use R&T and R&D Results for Security", Horizon 2020 Protection and Security Advisory Group Report 2 – 2020 – Dual-Use for Security, July, 2020, p. 3, https://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=3010.

[97] European Commission, "Roadmap for the Research and Development Activities on Space Critical EEE Components for European Non-Dependence in the Framework of the Horizon 2020 - Space", *Final Report by PWC*, November 3, 2015, p. 12, https://op.europa.eu/mt/publication-detail/-/publication/128d5baa-0784-11e6-b713-01aa75ed71a1.

## 4.2 Extending the EU's technological edge

It is equally necessary to ensure that the EU keeps up with rapid and unpredictable technological shifts. Such shifts are usually captured by a neat, albeit too simplistic, short-hand of "old space" versus "new space". What is true is that traditional launcher and satellite technologies and firms are being tested by new market entrants, increased miniaturisation and advanced manufacturing techniques, enhanced automation and cost reductions and new uses for space. Although Figure 9 highlights the supposedly key differences between "old" and "new" space, the reality is that technological developments are rarely so clear cut and today's technological realities do not match the futuristic visions of space regularly depicted by the media, vested industrial interests and even governments. That said, it is **best not to ignore the need to invest in technological developments just because of hype**. Indeed, Europe's own story of developing launchers may not have taken off without successive failures, investment and vision.[98] In this regard, the new Space Entrepreneurship Initiative ("Cassini") being pioneered by the Commission through the EUSP and the EU's "SME Strategy", should drive the Union's investment in space SMEs and start-ups – especially given how important these actors are to space technological innovation and supply chains.[99]

**Figure 9:** "Old Space" and "New Space"




*Visual design: EU Institute for Security Studies, 2020*

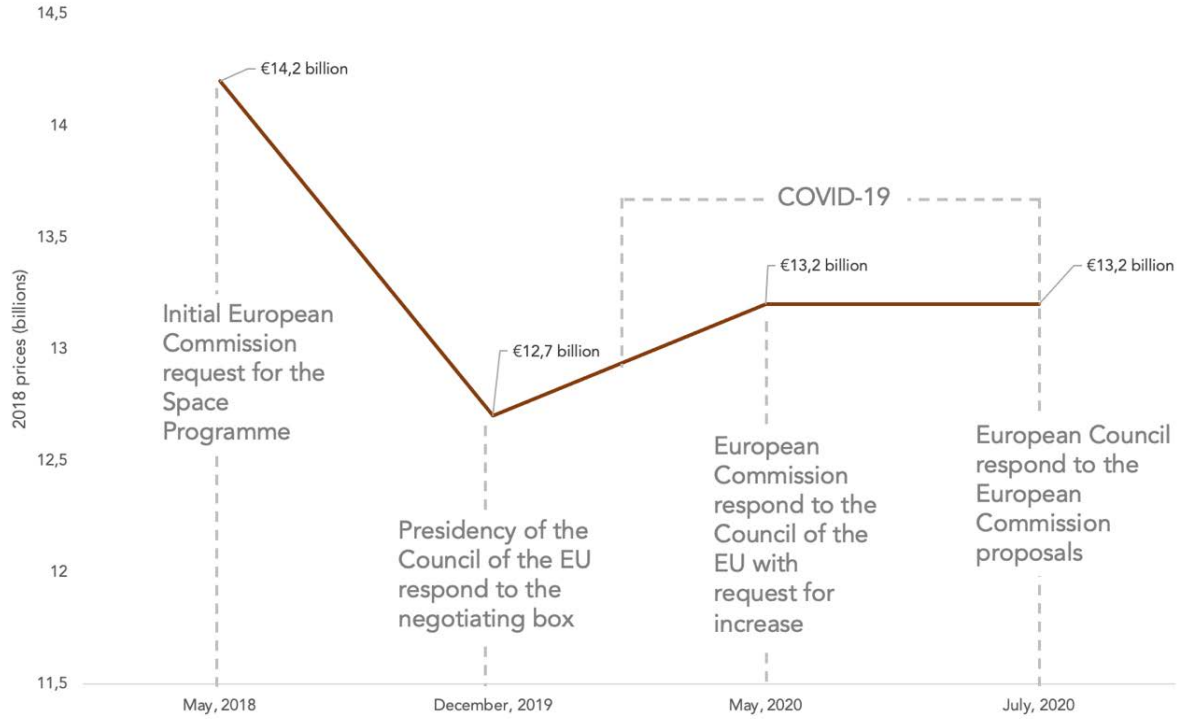
### 4.2.1 Investing in space

However, investments in high-technology areas will require a political decision regarding the financial critical mass required to support flagship projects within and across EU financing mechanisms. While there is a need to support space and defence SMEs with the EU's financial tools and mechanisms, one cannot

[98] Cenan Al-Ekabi and Panos Mastorakis, "The Evolution of Europe's Launcher and Flagship Space Initiatives", In Cenan Al-Ekabi (ed.) *European Autonomy in Space* (Heidelberg: Springer, 2015), p. 3.
[99] European Commission, "An SME Strategy for a Sustainable and Digital Europe", *COM(2020) 103 final*, Brussels, March 10, 2020, https://ec.europa.eu/info/sites/info/files/communication-sme-strategy-march-2020_en.pdf.

overlook the large-scale programmes that will truly drive the EU's strategic autonomy (in space and on earth). **Ambitious flagship space projects can only be made a reality with long-term and sustained financial investments**. Here, a core problem for European suppliers is that they are facing fierce international competition from entities that are often backed by large government programmes (e.g. US suppliers can rely on funding through NASA and the DoD) and funding and Covid-19 is not helping either. In Europe, SMEs and start-ups are more reliant on private investors and venture capitalists but this business pattern exposes firms to market shocks and financial crises.[100] This should trigger a warning for Europe. Indeed, the global space market is seeing the mushrooming of commercial actors, and in some ways this may provide governments with an excuse to reduce public investments in the space sector.[101] The EU should not fall for this logic, as **public and institutional investments will be vital for any future in space**.

**Figure 10:** MFF negotiations and the EU Space Programme




*Visual design: EU Institute for Security Studies, 2020*

*Data: European Commission, 2018-2020 and Council of the EU, 2019-2020*

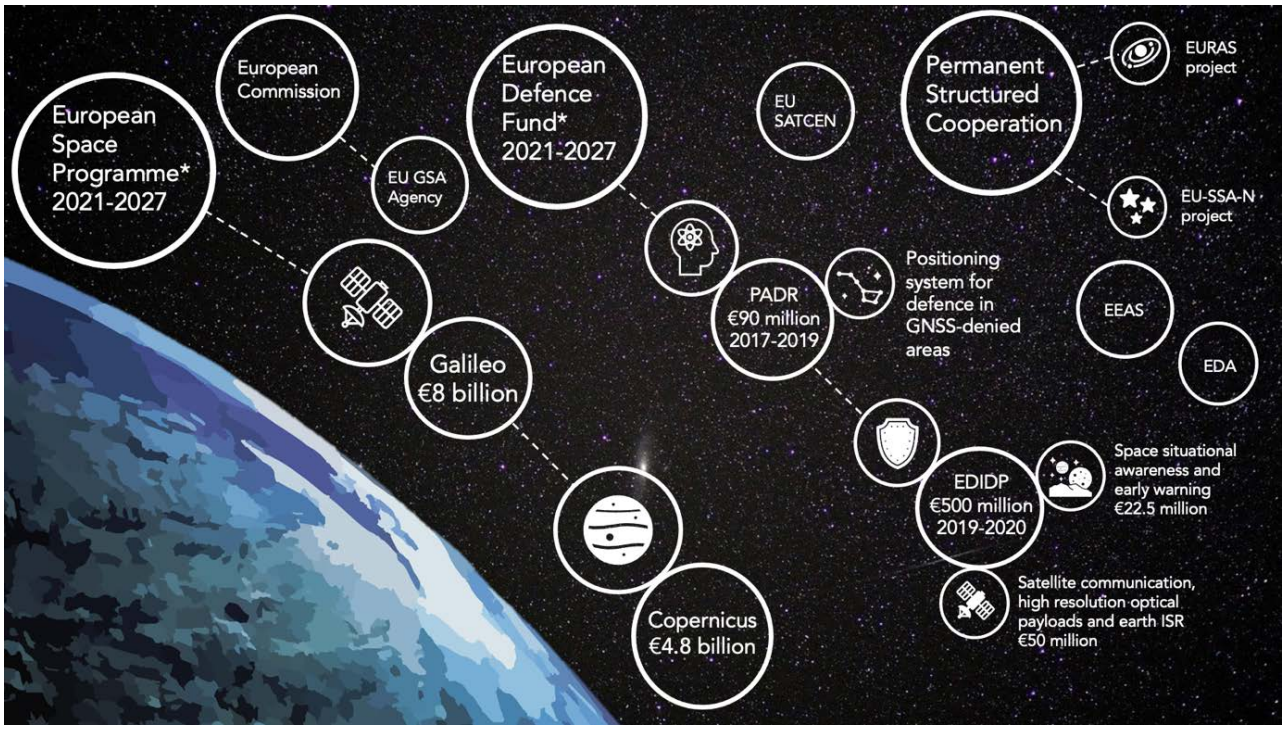
Note: * final budgetary amounts have not been agreed.

In this regard, **an added premium will be placed on insuring that the EU can blend existing financial tools and mechanisms** to support the technological advancement of the EU in space. Ideas such as creating an "EU Space Equity Fund" based on blended resources under the EUSP, the EDF, the InvestEU Fund[102], Horizon Europe and other financial arrangements could be explored. EU support and investment in this manner is vital to the European space sector because the industry depends on public funds and

[100] European Space Policy Institute, "Europe: Out of the Box", *ESPI Briefs*, no. 9, February, 2017.
[101] European Space Policy Institute, "Toward a More Strategic, Assertive and United Europe in Space", *ESPI Briefs*, no. 34, September, 2019.
[102] Council of the EU, "Partial Mandate for Negotiations with the European Parliament – Proposal for a Regulation Establishing the InvestEU Programme", *12207/20*, Brussels, October 30, 2020, https://www.consilium.europa.eu/media/46625/st12207-en20.pdf.

public sector instruments as a source of capital. What is more, being able to access such public or institutional sources of funding 'is a precondition for accessing private risk capital'.[103] Finally, sustained investments in the space sector ensures long-term planning and innovation within the space industry, and it allows industry to adapt to any regulatory and technology changes in global space markets.

**Figure 11:** Example EU space investments and projects




*Visual design: EU Institute for Security Studies, 2020*

Note: * final budgetary amounts have not been agreed.

### 4.2.2 Towards a quantum leap in space?

**Attaining the power to ensure secure flows and uses of data, signals and communication is of paramount importance for the EU's security and defence**. It is already a key feature of space defence that signals and data can properly be encrypted. Indeed, European armed forces are already well-versed in the need to ensure that spoofing and jamming technologies do not disrupt secure communications networks. Owing to the fact that space-terrestrial data download and transfer times are not instantaneous, there is a greater risk that encryption and authentication protocols can be hacked, damaged or interfered with or that telecommand and telemetry functions can be damaged. Keep in mind that **advances in cyberdefence capabilities increase the likeliness that space-earth communications links can be disrupted**. For example, military aircraft require open access to the sky to perform systems checks and computer resets and any interference of datalinks between the aircraft and satellites can lead to timing and computational errors that may imperil pilots.

[103] Alessandro de Concini and Jaroslav Toth, "The Future of the European Space Sector: How to Leverage Europe's Technological Leadership and Boost Investments for Space Ventures", a report prepared by the European Investment Bank for the European Commission, 2019, p. 9, https://www.eib.org/attachments/thematic/future_of_european_space_sector_en.pdf.

**Quantum computing and communications have the potential to revolutionise secure communications** and to drastically reduce the possibilities of jamming, spoofing and eavesdropping of data signals. European industry has already called on the EU to invest in quantum technologies so that the EU can communicate in a controlled and concealed way. In fact, the EU is being encouraged to lay the technological foundations today in order to be able to build a full Quantum Information Network (QIN) by 2034 under the 2028-2034 MFF.[104] The EU is certainly aware of the promise of quantum technologies for space and the EU economy more generally and it recognises that quantum technologies can enhance computational power, sensing and imaging systems and secure communications.[105] To this end, since 2018 the Commission has piloted a €1 billion flagship on quantum technologies ("EuroQCI" flagship) designed to pool European resources over a ten-year period in addition to funding for such technologies over the period of the next MFF (2021-2027). Such investments could help the EU master quantum technologies in the future and apply them to space and terrestrial applications.

## 4.3 Protecting critical infrastructure and supply chains

A third area that deserves attention at the EU level is the protection of critical supplies and supply chains. Indeed, **strategic autonomy in space relies on the safety and proper functioning of space and terrestrial infrastructure** (e.g. satellites and ground stations). Equally important is the need to ensure that there is no disruption to supplies of technologies, components and materials. The EU is steadily recognising that supplies and infrastructure are vital components of the Union's resilience and autonomy. Overseeing programmes such as Galileo has had the effect of alerting the EU to the need for critical infrastructure and supply safeguards. In this respect, there is a need to recognise that flagship programmes such as Galileo or any future satellite constellation may integrate non-EU technologies and this may in some cases pose a potential dependency. Control of technology and IPRs are an essential feature of strategic autonomy (autonomy to and autonomy from).

### 4.3.1 Critical infrastructure protection

As stated earlier, the EU's economy is set to become more connected but with greater connectivity comes a higher potential for risk. Here, space and terrestrial infrastructures are interwoven and this means **an overall strategy is required that maps out infrastructure linkages, identifies vulnerabilities and develops a plan of action to manage resilience**. This will imply much greater regulatory and commercial convergence between space and telecommunications. It will imply a more encompassing approach to protecting space-based assets and the terrestrial installations that are vital to maintaining the EU's strategic autonomy. In space, it is important to recognise the risks posed by space debris, space weather events and military interference (e.g. electronic warfare or chemical spray attacks[106]). There is a growing need to protect satellites and orbital space from hostile actions and occurrences. **Strategic autonomy in space presumes that a space actor has the ability to dissuade and respond to events**, and that in the event of a satellite loss that it has the capacities to track and recover the unit.

**There are three key elements to protecting space-based infrastructures: situational awareness, technological advances and regulation**. First, Space Situational Awareness (SSA) is key because space is

[104] "European Industry White Paper on the European Quantum Communication Infrastructure", 2019, p. 2, http://www.qtspace.eu/sites/testqtspace.eu/files/other_files/IndustryWhitePaper_V3.pdf.
[105] European Commission, "Commission Staff Working Document on Quantum Technologies", *SWD(2016) 107*, Brussels, https://ec.europa.eu/digital-single-market/en/news/commission-staff-working-document-quantum-technologies.
[106] One theory is that chemicals carried on satellites could be used to damage or blind other satellite lenses and cameras. This would serve as a sort of "hybrid space attack" while not damaging the satellite proper. For example see, Joseph Trevithick, "A Russian 'Inspector' Spacecraft Now Appears to be Shadowing an American Spy Satellite", *The Drive*, January 30, 2020, https://www.thedrive.com/the-war-zone/32031/a-russian-inspector-spacecraft-now-appears-to-be-shadowing-an-american-spy-satellite.

an environment where proving hostile intent is difficult due to the fact that it is easy to hide from detection and sizeable geospatial distances are the norm. In this respect, it is important to note the existence of the Framework for Space Surveillance and Tracking Support (EUSST), which is responsible for ensuring space surveillance and tracking (SST) and monitoring space weather (SWE) and near-earth objects (NEOs). Set up in 2015 and consisting of 7 EU member states, EUSST relies on a network of lasers, radars and telescopes based across the world and owned by EU member states' national authorities. The EUSST ensures that data is processed and delivered to European users. Although driven by civilian user requirements and not military purposes[107], the EU SatCen is an important member of the EUSST consortium and it works towards ensuring the protection of space assets for the CFSP. Today then, the EUSST serves civilian rather than military user needs and European military SST is conducted by national authorities.

Second, there is a need for the EU to undertake **strategic horizon scanning for new technologies that may either enhance or underline the protection of critical space infrastructure**. This study has already flagged the need to invest in quantum technologies, but it is increasingly necessary to understand what technologies will be required by the EU in the future in order to physically protect its core space infrastructures. We are not here speaking about a need to invest in kinetic space technologies as this would breach existing international norms and law. However, a non-kinetic method of protecting satellites is to invest in stealth technologies as a way to camouflage infrastructures and avoid risk. This implies that a much **a higher value should be placed on protective design and integrated technologies** at the R&D stage.

Finally, **regulation is key to the protection of critical space infrastructures but existing EU legislation is rather ambiguous when it comes to space**. For example, the 2008 EU Directive on Critical Infrastructure Protection does not cover space and it mainly applies to infrastructure that is located in Member States.[108] The Directive is currently under revision and it is important to ensure that space is not overlooked as the work progresses, despite the fact that the protection of space infrastructure is usually treated as a national competence. It is encouraging to learn that the recent evaluation undertaken by the Commission acknowledges that space is not covered by the Directive and that future EU actions on critical infrastructure avoid coordination gaps and mitigate the risk of misalignments among different sectors such as space.[109] Avoiding such misalignments is particularly important when one considers that **Galileo's space infrastructure is dependent on ground segments that are located in different EU member states**. Lastly, we should not overlook the potential of the EU's recently agreed foreign investment screening mechanism to safeguard against potentially external investments in Europe's space sector.

### 4.3.2 Safeguarding supply chains

In addition to critical infrastructure protection, it is necessary to secure critical supplies and supply chains.[110] Fortunately, the EU and European partners have already begun to map critical space technology dependencies. Indeed, since 2009 a Joint Task Force composed of the Commission, ESA and EDA have been

[107] See Recital 15, "Decision Establishing a Framework for Space Surveillance and Tracking Support", *Decision No. 541/2014/EU*, April 16, 2014, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0541&from=EN.

[108] See Article 2(a) of "Council Directive on the Identification and Designation of European Critical Infrastructures and the Assessment of the Need to Improve their Protection", *2008/114/EC*, December 8, 2008, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0114&from=EN.

[109] European Commission, "Staff Working Document – Evaluation of Council Directive 2008/114", *SWD(2019) 310 final*, Brussels, July 23, 2019, p. 20, https://ec.europa.eu/home-affairs/sites/homeaffairs/files/what-we-do/policies/european-agenda-security/20190723_swd-2019-308-commission-staff-working-document_en.pdf. See also European Commission, "Staff Working Document – Comprehensive Assessment of EU Security Policy: Ninth Progress Report Towards an Effective and Genuine Security Union", *SWD(2017) 278 final*, Brussels, July 26, 2017, p. 25, https://eur-lex.europa.eu/resource.html?uri=cellar:b43f3517-720a-11e7-b2f2-01aa75ed71a1.0001.02/DOC_1&format=PDF.

[110] European Commission, "12th Annual Space Conference – Closing Speech and Thierry Breton", Brussels, January 22, 2019, https://ec.europa.eu/commission/commissioners/2019-2024/breton/announcements/12th-annual-space-conference-closing-speech_en.

working to identify technologies that should either be produced in Europe or diversified through other supply chains. In this respect, the Joint Task Force has identified a number of critical areas that should be addressed over the 2021-2023 period including **non-dependence in microelectronics, power systems, propulsion, optics, materials, radio frequency systems and other areas by 2023**. This is particularly important because many of these technologies are vital to the autonomous execution of space missions related to security, observation, RPAS, navigation and defence. It is also crucial that the EU strive for non-dependence from non-EU suppliers in key technologies such as atomic clocks, robotics, quantum technologies and cybersecurity systems.

Another dimension of supply chain security are the extra-territorial regulations that the EU is exposed to, which can hamper industries to develop and transfer technologies. In particular, due to 'the dual-use and highly sensitive nature of most space technologies, they are often subject to export restrictions as strategic and defence-related items'.[111] For example, **having the ITAR hanging over European industry poses serious questions about the EU's degree of autonomy in supply**.[112] ITAR limits the exportation and transfer of 'foreign manufactured goods and equipment that incorporate US-origin content' such as technologies, systems and software.[113] The US has legitimate reasons for imposing ITAR, especially because Washington is keen to stop China from acquiring a range of sensitive dual-use goods and technologies and integrating them into military systems. In fact, on 29 June 2020 additional measures introduced by the US government tightened existing regulations to restrict the export of dual-use technologies to China (including space). However, such controls affect Europe because they ensure that the US government can control European-made space systems if they integrate any US components, data, technology, software or information. Accordingly, ITAR is not simply about US national security as it offers an unfair competitive advantage to US suppliers that already benefit from high production runs and lower prices.[114]

A similar extra-territorial approach has been taken by the US with regard to the adoption of Space Policy Directive-3 in 2018. While the Directive has been lauded by the US government as an attempt to ensure secure Space Traffic Management (STM) at a time when there is greater congestion in space, it is clear that it is also an attempt to export US standards in data and information sharing in such a way as to ensure the industrial competitiveness of the US' space industry. As the Directive makes clear, a new US approach to STM must set priorities that 'incorporate national security considerations, encourage growth of the U.S. commercial space sector, establish an updated STM architecture, and promote space safety standards and best practices across the international community'.[115] While the Directive is geared to America's national interests, it also symbolises a "first mover" strategy in STM to ensure that partners in Europe adhere to US standards and norms. This could, in turn, mean that **not only would EU member states become dependent on the US' STM industrial and technological capacities, but that the protection of key EU space-based assets would fall under the protection of the US government**. If EU member states do not want to fall foul of this extra-territorial move or become dependent on US STM policy and capacities for EU

[111] Letizia Caito, "European Technological Non-Dependence in Space", *ESPI Report 51*, September, 2015, p. 7.
[112] Sénat Français, "L'europe spatiale: Une ambition necessaire, entre puissance et interdépendance", November 9, 2020, http://www.senat.fr/rap/r12-114/r12-1143.html.
[113] Ginger T. Faulk and Jeffrey P. Bialos, "Unpacking US-China Sanctions and Export Control Regulations: the China 'Military End Use' and 'Military End User' Rule and the Department of Defense List", *Global Trade*, October 26, 2020, https://www.globaltrademag.com/unpacking-u-s-china-sanctions-and-export-control-regulations-the-china-military-end-use-and-military-end-user-rule-and-the-department-of-defense-list/.
[114] European Commission, "Roadmap for the Research and Development Activities on Space Critical EEE Components for European Non-Dependence in the Framework of the Horizon 2020 - Space", *Final Report by PWC*, November 3, 2015, p. 12, https://op.europa.eu/mt/publication-detail/-/publication/128d5baa-0784-11e6-b713-01aa75ed71a1.
[115] White House, "Space Policy Directive-3, National Space Traffic Management Policy", *Presidential Memoranda*, June 18, 2018, https://www.whitehouse.gov/presidential-actions/space-policy-directive-3-national-space-traffic-management-policy/.

space assets, it needs a coherent space diplomacy and strategies to support European industry in STM through investments and norm-setting.

## 4.4 EU space, security and defence

The fourth area of the EU's strategic autonomy that requires greater attention is the link between space and defence, although in this area much will depend on the political willingness of EU member state governments.[116] By link, we do not mean here just industrial or R&D links but operational and capability ones too.

### 4.4.1 Enabling the ability to act

**If the EU is to ensure that it has the capacity to act on earth as a credible security and defence actor, then it needs to ensure that EU space initiatives meet the needs of European armed forces**. Space is not a place where actors win wars, but they may well lose them on earth should space not be harnessed effectively as a strategic enabler. Today, the defence of space systems and earth-based capabilities that are dependent on space are particularly vulnerable to electronic warfare that can effect signals communications and orbital calculations and data sensing. We know that there is a need for the EU to stay abreast of technological developments such as the potential future use of sophisticated electronic warfare capabilities and other disruptive technologies in space. It is also true that Europe's armed forces are increasingly dependent on earth observation (earth imagery, weather, intelligence and missile warning), telecommunications (secure narrow and broad bands and data secure communications) and PNT capacities in order to perform their duties.

While most of the answers to these questions will be provided by industry and technology, this should not discount the importance of strategic space-defence planning. Indeed, space is mentioned by the EUGS and the Implementation Plan on Security and Defence (ISPD), and such documents have aided the initiation of several EU space-defence capability and technology projects. What is missing, however, is a more focused understanding of how the EU could treat space from a military perspective. This may sound like a taboo subject, but the EU is, after all, funding space-defence technologies. PNT and SST are vital components of the EU's ability to react militarily but yet the EU has not developed an overarching concept for the way it understands the links between space and security and defence. In this regard, **the forthcoming "Strategic Compass" could be an ideal opportunity to integrate space into CSDP and EU security and defence more broadly**. There is not one basket under the Strategic Compass – crisis management, resilience, capability development and partnerships - that is not relevant to or affected by space.

The need for a strategic vision for space and defence is not simply theoretical. For example, it is worth asking **how space should be thought of in light of some important EU Treaty provisions such as the mutual assistance[117] and solidarity[118] clauses**. At first glance, one might argue that Article 42.7 does not really apply to space because the clause refers to an 'armed aggression' on the 'territory' of a member state. Stricto sensu it may be argued that the word 'territory' effectively rules out space as the Treaty specifically references attacks on land or within maritime boundaries and airspace. However, acts of armed aggression on the territory of an EU member state can be supported from space and any destruction of EU space infrastructure could disable terrestrial defences. As far as Article 222 is concerned, space should not be neglected as part of any joint action to assist a member state in case of a terrorist attack or natural or man-

[116] Mathieu Bataille and Valentine Messina, "Europe, Space and Defence: From 'Space for Defence' to 'Defence of Space'", *ESPI Report*, no. 72, February, 2020, p. 48.
[117] Article 42.7 of the Treaty on European Union.
[118] Article 222 on the Treaty on the Functioning of the European Union.

made disasters.[119] Of course, because NATO has declared space an operational domain it is necessary for the alliance to assess how space-based threats could be covered by Article 5 of the Washington Treaty and collective defence.[120]

Additionally, we should not overlook the **important role that space can play in the EU's diplomacy, partnerships and support for multilateralism**. In particular, the Space Task Force should be recognised as a core hub through which the EU can promote space partnerships and space diplomacy. It plays a key role vis-à-vis the HR/VP who in turn brings together the EEAS, EDA and SatCen. With the correct level of resources, the Space Task Force would be in a better position to promote the responsible use of space internationally and it could build on its positive contributions to the 2030 Space Agenda and the UN Committee on the Peaceful Uses of Outer Space (COPUOS). What is more, the Space Task Force plays a vital role alongside SatCen in promoting the Union's geospatial awareness and intelligence with partners. To date, SatCen's services have been promoted by the Task Force with partners such as the African Union (AU), the OSCE and the International agency for Atomic Energy (IAEA). There is scope for the Task Force to advance space issues within the context of the EU's Strategic Partnership Agreements (SPAs) and EU-NATO cooperation, however, it requires greater resources in order to conduct more ambitious EU space diplomacy.

Yet, **EU Space Diplomacy is only as strong as unity between EU member states**. In this respect, there are notable divisions between member states on how to utilise and view space. Such divisions leave the Union exposed to "divide and rule" strategies by third states. The October 2020 Artemis Accords highlight the problem well. The Accords are a US initiative to forge a common position on the use of space and they take a controversial approach by prefiguring potential activities on the Moon, Mars, comets and asteroids that have no firm consensus in multilateral fora or international legal interpretations. The current US administration has opted for bilateral space agreements as a way for the US to export norms and policies that are designed to push America's competitive advantage and vision for space.[121] To date, the US and two EU member states have bilaterally signed the Accords (rather than the EU as a whole). **While the Artemis Accords are not legally binding, they have exposed EU member states' divisions on space use** and this makes it incredibly difficult for the Union to forge a common space diplomacy or ensure its strategic autonomy.

### 4.4.2 Space defence capabilities

To say that the EU is not working to develop space-defence technology needs is false. For example, space has already been integrated into the EDA's Capability Development Plan (CDP) and in 2018 it designated the following areas as capability priorities from a defence perspective: earth observation, PNT, SSA, satellite communication, information superiority and management, ISR and cyber defence. To fill these capability gaps, the Agency has initiated R&T programmes that model and simulate micro-satellite clusters (i.e. the Miracle II project), develop geospatial information support (e.g. the GISMO project) and it has even been mandated to study the requirements and business case for military PNT by 2020.[122] Such efforts are being taken up through other mechanisms such as PESCO and the EDF, and **there is an opportunity for the EU to enhance greater awareness of space-defence matters and to better plan for the development of**

[119] Council of the EU, "Council Decision on the arrangements for the implementation by the Union of the solidarity clause", *2014/415/EU*, June 24, 2014, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014D0415&from=EN.

[120] Alexandra Stickings, "Space as an Operational Domain: What Next for NATO?", *RUSI Newsbrief*, October 15, 2020, https://rusi.org/publication/rusi-newsbrief/space-operational-domain-what-next-nato. See also: Jens Stoltenberg, "NATO will defence itself", NATO, August 27, 2019, https://www.nato.int/cps/en/natohq/news_168435.htm?selectedLocale=en and Aurel Sari, "NATO in outer space: a domain too far?", *Articles of War*, Lieber Institute West Point, October 1, 2020, https://lieber.westpoint.edu/nato-outer-space/.

[121] "Artemis Accords: What Implications for Europe?", *ESPI Briefs*, no. 46, November, 2020.

[122] European Defence Agency, "Space", September 21, 2018, https://www.eda.europa.eu/docs/default-source/documents/eda-information-sheet-on-space.pdf.

**space-defence capabilities**. It should also be noted that the EDA's Coordinated Annual Review on Defence (CARD) offers a good opportunity to focus member state investments in space and defence. Furthermore, the Agency's work on Key Strategic Activities (KSAs) and the space-related Technology Building Blocks (TBBs) under the Overarching Strategic Research Agenda (OSRA) have already stressed the importance of technologies for space situational awareness and communications encryption.

To date, in PESCO there are three specific space-related projects focusing on radio navigation ("EURAS"), military space awareness ("EU-SSA-N") and space early warning and interception ("TWISTER"). The EURAS project seeks to benefit from Galileo's PRS by promoting the development of EU military PNT capabilities. For its part, EU-SSA-N adds to the civilian nature of the EUSST by ensuring that the Union has the means to protect member state space defence assets and services. **The preparatory mechanisms under the EDF are supporting space-defence capability development.** The PADR is supporting R&D projects for quantum secure communication and navigation and a defence positioning system in GNSS denied areas (see the "Quantaquest" and "Optimise" projects). The EDIDP is financing 3 specific projects including: 1) a persistent earth observation from space capability that fuses automated data processing, AI and real time processors and sensors (i.e. the "PEONEER" project); 2) a cost-effective and very high resolution optical capability for small satellites (i.e. the "OPTISSE" project); and 3) a project to benefit from Galileo's PRS for defence-specific requirements (i.e. the "GEODE" project). This last project is linked to the EURAS project within PESCO.

What is noticeable is that each of these PESCO and EDF (PADR/EDIDP) projects work with and adapt to existing EU space initiatives such as Galileo and EUSST. In this sense, **PESCO and the EDF have been effective in allowing member states to develop defence-relevant capabilities together despite the civil nature of existing space projects**. This presents an opportunity to avoid duplication and costs. This type of logic undergirds the EU member states' approach to Government Satellite Communications (GovSatCom) too, as access to secure communications is a prerequisite for armed forces that operate in hostile environments. **Developing EU GovSatCom is important because the US, China and Russia are developing, refining or modernising military intelligence and communications systems**. First announced in 2013 and then referred to in the EUGS in 2016, there is a consensus that developing a GovSatCom capability would contribute to the EU's strategic autonomy in space, security and defence. So far, the EDA has brought GovSatCom forward by identifying civil-military user needs, demonstrating the business case for the system for governments and CSDP users and conducting an impact assessment along with the Commission and ESA. Since this time, GovSatCom has been included in the EUSP and it is foreseen that an initial capacity will draw on private and member state capacities until 2025 in order to gauge government demand. **The fact that such a project will be financed by the EU is a significant step in enhancing the secure communications of European armed forces**.

### 4.4.3 Geospatial intelligence

Another key aspect of the EU's space-defence capability set relates to geospatial intelligence. It is true that a number of EU member states have their own military grade earth observation systems (e.g. Cosmo-SkyMed, Hélios, SAR-Lupe, etc.), but there is no guarantee that national geospatial intelligence will be shared. This is why SatCen remains relevant, as it provides such intelligence for the EU as a whole. Indeed, the Centre provides a range of EU, national and international consumers with high quality intelligence of satellite imagery. It plays a key role in CFSP and CSDP and it informs decision-makers with tailored intelligence products. While it is true that a range of commercial firms can provide satellite imagery, **SatCen is unique in being able to provide institutional and political authorities with sensitive and classified analysis**. Without SatCen, there would be no other central EU body to provide sensitive analysis in support of crisis management tasks, border management, the delivery of EU humanitarian aid, disaster monitoring, etc. We should not forget that SatCen plays a vital role within EUSST, which contributes to the security of European space assets in orbit.

Clearly, many see the Centre as a key enabler of strategic autonomy as demand from the EU member states and the EEAS has increased steadily since 2014 and in 2019 the Centre delivered a total of 3,080 products compared to 478 in 2009.[123] Yet, the SatCen must be supported in its role. A major priority is to ensure that the Centre is placed on a sound financial footing, but in a way that it can grow to accommodate greater demand and to seize the opportunities of the "new space" evolution and technological advances. At present, the SatCen budget is provided by national contributions but it might be necessary to consider new financial arrangements to ensure that the Centre has the resources it requires. **While SatCen will remain an intergovernmental body, it is worth exploring whether resources from the EU budget could not be made available in future**. However, such a move should be accompanied with an expansion of the Centre's role as the EU experiences a wider array of security challenges in space and on earth. Keep in mind that several **internal security tasks could benefit from SatCen's expertise**, and it should not be overlooked that the Centre could play a vital role in case either the EU's mutual assistance or solidarity clauses are invoked.

# 5 Conclusion and recommendations

Space is one of the domains where the EU has achieved a degree of strategic autonomy. This is because the EU had a clear vision for space, it has invested financial resources and it has launched ambitious projects. Overall, the EU has been able to specify why it wants autonomy in the first place (autonomy for), what resources it requires to achieve it (autonomy to) and how it intends to use this autonomy to lower dependencies on external factors and actors (autonomy from). In this sense, the first of three questions posed at the start of this study can be answered by saying that **the EU recognises that space is vital for its economy and security**. The second question, which asked if space had contributed to the EU's strategic autonomy, can be answered with a qualified yes. Indeed, the third question on what more is needed to enhance the EU's autonomy in space is a key one that poses many challenges and difficult choices. The EU's positive actions in space should not breed complacency. Strategic autonomy is not something that can only be achieved, for it can also be lost over time too. A priority for the EU, therefore, is to **tend to its existing degree of strategic autonomy in space with further investments that harness emerging technologies and support the European space market**. None of this is really possible, however, without a strong degree of political will from EU governments.

This study has shown how any discussion about EU strategic autonomy in space has to contend with two trends. First, **space is a geopolitical realm** and, while most space-faring nations claim to be invested in the peaceful use of space, the reality is that countries such as the US, China and Russia are moving at some speed to develop space capacities for their military power. This current geopolitical context demands that the EU reframes how it sees its role in space. If indeed outer space is an additional domain for geopolitical tensions to be played out (and if it is a domain that contributes to geopolitical competition back on earth), questions about the EU's readiness and willingness to engage in the space domain from a defence perspective are legitimate. For the EU, this implies that while it wants to adhere to international legal obligations it will exist alongside countries that may actively blur the line between space and defence for geopolitical reasons.

Second, **space is a technological frontier** and the space sector is presently subject to rapid technological shifts, but it could also be one where the line between space systems designed for peaceful and military purposes is increasingly blurred. In the present period of economic crisis due to the pandemic, the risk of underinvestment in the civil and defence sectors may spill-over into the space sector – and the European space sector itself is in need of sustained levels of investment. This is a crucial time for the technological advancement of the European space sector and there should be a strong recognition that EU strategic

[123] EU Satellite Centre, "EU SatCen Annual Report 2019", 2020, p. 30, https://www.satcen.europa.eu/keydocuments/EU%20SatCen%20Annual%20Report%2020195ea979f2f9d71b083826a79a.pdf

autonomy in space can only be achieved with the technical know-how and innovation of Europe's space industry.

Given these two trends, it is possible to make several recommendations that could be considered as a pathway to maintaining and extending the EU's strategic autonomy in space:

## 5.1 Invest in the European space sector

Given the economic pressures unleashed by the Covid-19 pandemic, the growing competition on international space markets and the specific nature of the space sector, there is a need to support the European industry with long-term public investment and to ensure that space SMEs and start-ups in the EU can access private capital. Ultimately, the EU cannot hope to develop into a space-defence without wider investments in the sector. This can be done by:

- **aiming for a greater and sustained European physical presence in space** through more regular launches and exploration projects. European launchers should be used for European space launches. The European Parliament can support efforts such as the "Cassini" initiative to ensure that SMEs and start-ups can support space innovation and sustained EU presence in space;
- **initiating ambitious flagship projects** such as a secure second-generation of Galileo and an EU satellite constellation for extensive and high-speed broadband coverage. Such projects would constitute an important signal for the European space sector and allow the Union to ensure connectivity as part of its digital strategy;
- **blending funds** from the EUSP, EDF, InvestEU Fund and Horizon Europe to boost the EU's competitiveness and strategic autonomy in space. A commitment is needed to maintain institutional and public investments in the space sector. It is also important that dual-use investments incorporate any military requirements at the earliest possible stage;
- **become an international standard setter** in key areas such as STM and ensure that investments are directed towards the protection of EU space-based assets. Here, it is crucial that the Union invests in STM and SSA as a way to ensure that the Union does not become dependent on third states for the protection of its core space assets. The Parliament can play a key role in working with the Commission to ensure that international norms work for European space interests.

## 5.2 Transform the EU into a space technology power

If the EU does not harness the power of emerging technologies then it will experience an erosion of its strategic autonomy in space (and elsewhere). The EU could be bold in investing in emerging technology fields such as advanced launchers, nano satellites and quantum communications. It could also pursue other initiatives such as:

- **building on existing initiatives** like EuroQCI, the EU could develop a space-quantum roadmap that brings together stakeholders and details key milestones indicating the EU's technological progress. The EU has until the end of the 2020s to ensure that competitors do not dominate quantum in space technologies. Here, the European Parliament could apply political pressure to ensure that such technological deadlines are met;
- **creating synergies between the EU's civil, space and defence programmes**. While recognising the specificities of each sector, the EU could develop technology roadmaps that include the space sector. This could unlock innovation, avoid duplication and costs and contribute to market certainty in Europe while also allowing start-ups and SMEs to contribute to the EU's space innovation. The Parliament has an important role in ensuring that synergies are maximised for SMEs;

- **lowering strategic dependencies on third states** for technologies, materials, industrial capacity especially with regard to Galileo. Strategic autonomy in space will depend upon enhancing the Union's resilience against supply shocks. It is worth exploring how Horizon Europe and the Action Plan on Raw Materials can support critical needs. There could also be scope to potentially utilise the Recovery and Resilience Facility to help reskill and upskill human capital in the sector;
- **mapping supply vulnerabilities** through enhanced and integrated horizon scanning of the European space industry and flagship programmes like Galileo. This could be achieved by upgrading the Joint Task Force (JTF) on Critical Space Technologies for European Strategic Non-Dependence. The JTF comprised of the Commission, EDA and ESA could become a permanent entity and it could draw on EU efforts in investment screening, plus parallel defence processes such as the EDF, CARD, CDP and PESCO. To give such a process greater political visibility, the European Parliament could consider a yearly discussion in relevant committees on whether EU efforts to achieve non-dependence in critical space technologies is succeeding;
- **ensuring that space is fully integrated into the EU's critical infrastructure protection efforts.** Given the ongoing work to revise the Directive on Critical Infrastructure Protection, and despite the fact that it space infrastructure is a national competence, the European Parliament could ensure that space is sufficiently integrated into the revised Directive. As a minimum step, the revised Directive could do more to ensure information exchange between national authorities on potential threats to space and ground-based infrastructures.

## 5.3 Prepare for geopolitical competition and space

Any discussion about the EU's strategic autonomy in space is, in fact, also one about its terrestrial strategic autonomy. However, the EU lacks an overarching concept for space, security and defence. The development of space assets will have an increasingly large bearing on the Union's ability to project force over large geographical spaces, and space is key for logistics, PNT and ISR, among other things. The EU could inform such a conceptualisation by:

- **raising political awareness about the links between space and defence**. This can be initiated at the highest political level should the planned Special European Council in February 2021 on Security and Defence[124] go ahead, as it would allow for a focus on linkages between space, security and defence. Common political signalling from the Presidents of the European Parliament, European Commission and the European Council, plus the HR/VP and the European Commissioner for the Internal Market would be a significant step forward. The Parliament could in the short-term send an urgent political signal that EU unity of purpose in space is required, and that organising such a Special European Council is of paramount importance;
- **instil greater political unity and coherence in EU space policy**. If the Special European Council meeting takes place in February 2021, it could be the launch pad for a more permanent "European Space Council" that could bring key institutions and bodies together to advise the European Council and its President on space issues. To date, the division between EU member states on space policy is encouraging third states to experiment with "divide and rule" strategies. The Parliament could lend its strong voice of support for the creation of a "European Space Council" as it could be a logical forum to: forge a common EU Space Vision and Space Diplomacy, raise the political awareness of space in the minds of European citizens and discuss how the EU should support its industry in the context of extra-territorial measures that affect competitiveness;

[124] European Council, "Leaders' Agenda 2020-2021", https://www.consilium.europa.eu/media/45951/leaders-agenda-2020-2021-en.pdf.

- **support and enhance existing** EU space bodies such as the SatCen and the Space Task Force. With the right level of resources, these bodies can ensure that the Union's geospatial intelligence services and space diplomacy become core products of EU external action. Space can be an essential foundation for the Union's strategic partnerships and support for multilateralism. In particular, the European Parliament could explore the modalities for potential contributions to SatCen from the EU budget as a way to ensure the financial sustainability of the Centre and ensure the EU's continued geospatial capacities. As far as the Space Task Force is concerned, the Parliament could call for greater human resources to be dedicated to its work and link this with a call for more visible EU Space Diplomacy;
- **using the "Strategic Compass"** to initiate a reflection on the EU's approach to space, security and defence. A follow-on inter-institutional space-defence mapping exercise could analyse technological and geostrategic needs, operational requirements and international law with a view to encouraging a common institutional effort on space and defence and avoiding any potential duplication of efforts;
- **leveraging existing mechanisms such as PESCO and the EDF** to further develop space-defence capabilities and to support the integration of emerging technologies where appropriate. For PESCO's strategic phase 2021-2025, a more concerted focus on space capabilities is required but not without creating strategic project baskets that more clearly connect PESCO projects. The CDP and CARD are key tools in identifying space-defence capability and technology pathways;
- **enhancing the EU's space-defence preparedness capacities** by testing scenarios involving a loss of space capacities such as communications and PNT and their impact on CSDP operations and missions, encouraging EU-NATO cooperation on space preparedness and analysing the space-related contingencies of an invocation of the mutual assistance and solidarity clauses.

PE 653.620
EP/EXPO/B/SEDE/FWC/2017-01/05

Print ISBN 978-92-846-7528-9 | doi: 10.2861/483221 | QA-03-20-833-EN-C
PDF ISBN 978-92-846-7527-2 | doi: 10.2861/983199 | QA-03-20-833-EN-N