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Europe's Strategic Autonomy in space, through space

From the vantage point of Earth's orbit in outer space, over the last 60 years we have learned to observe, to understand, to connect, and to protect our planet. We're now able to monitor its environment, enforce policies, and enable our economies as well as their green and digital development while preserving the safety and security of our citizens. On Earth, investments in space industries and downstream sectors, depending on the space applications, are a recipe for creating highly-skilled jobs, high-tech, and high-added-value business and economic growth to ensure global European competitiveness. Autonomy in space applications would be a means to allow Europeans to remain masters of their data and secure Europe's role in the world. This policy paper aims at summarising the role that mastering space technologies has played and will continue to play—not only in the previous century but even more so in the 21st century—in the global and geo-political competition.



Piero Messina

Senior Policy and
Strategy Officer
Director General's
Services, European
Space Agency

Europe and Space

The European Union is asserting its position as one of the most relevant global actors in an economic, industrial, and strategic sense with respect to the discussion about space strategy. Eventually, it will be our very way of life that is at stake.

Programmes such as Galileo, Copernicus, and Ariane, along with their enabling technological and industrial bases, are among the most visible European space assets. They are the outcome of several decades of joint investment in space. However, the pace of international competition in space is accelerating, and Europe cannot afford to lose ground in this domain if it is serious about and committed to its strategic autonomy.

The founding legal principles of space activities were developed in the 1960s in the form of international treaties, and these have served us well until now. "New space", the "democratisation of space", and other expressions are used to try and capture the evolution in the nature and number of players active in outer space. While all space activities are carried out under the responsibility and the supervision of states, the number of private players has increased dramatically. These include, on one end, some of the richest entrepreneurs on Earth pursuing their visions and commercial interests in outer space, and, on the other end, a plethora of start-ups. Moreover, the number of nations with access to national space systems has also been on a constant increase over the years. In this context, it is worth noting that the UN Office for Outer Space Affairs (UNOOSA) numbered 18 members at the time of its inception in 1958 and 61 by the end of the 20th century. Today, 95 countries have a seat at UNOOSA in Vienna.

Space as a geo-political frontier

Under these circumstances, space is quickly becoming (or returning as) a political and geo-political frontier. New rules will have to be drafted to ensure the continuous, sustainable, and peaceful utilisation of outer space for the benefit

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of humankind. For Europe, strategic autonomy will also mean the ability to speak with a strong, credible, and united voice, the voice of a prime player in international fora to make sure its values and interests are properly represented.

In recent months, even as public authorities are still fighting the pandemic, space activities have been making headlines almost daily. Many things are happening, which is a sign that interest in space is far from depleted: the renewal of space governance leadership in Europe; the first module of the new Chinese space station; NASA's latest decision to approve the construction of the newest human-rated moon lander since Apollo's Lunar Module (LM) Eagle in 1969 (quickly stopped by legal action from competitors); European Parliament's recent approval of the EU Space Programme regulation;¹ and the European Space Agency's currently ongoing selection of a new class of European astronauts (the first selection since 2009).²

Artemis, EUSPA, Cassini, Starship, Tiangong, Crew Dragon: these new names embody a new dynamic that seems to have picked up speed in the last couple of years. A number of factors are now converging, and among the most important of these is pressure from private space entrepreneurs in the USA (Elon Musk's SpaceX

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and Jeff Bezos's Blue Origin, above all) and the steady, regular pace of the Chinese space programme. A new race seems to be taking shape, this time between the USA and China, to "occupy" and control space, including the Moon, but also to win allies, support their high-tech industries, inspire the world's population, and exercise soft power.³

One of these "occupations" of outer space is actually already undergoing: massive constellations of small-mass satellites are being deployed by private actors (Space X) in low to medium orbit around Earth to provide the world's population with ubiquitous connectivity and prepare for the deployment of 5G/6G-supported services.

Since the beginning of the space age in 1957, only a few thousand satellites have been launched cumulatively by all space-faring nations. Some 6,000 satellites are orbiting Earth today, only half of which are still operational while the remainders are out of service.

1 European Commission, "EU Space Regulation ready to take off" [news article] (28 April 2021), https://ec.europa.eu/defence-industry-space/eu-space-regulation-ready-take-2021-04-28_en.

2 The European Space Agency, "New class of European astronauts report for training" (3 September 2009), http://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/European_Astronaut_Selection_2008/New_class_of_European_astronauts_report_for_training#:~:text=The%20new%20astronauts%20are%3A,Mogensen%2C%20from%20Copenhagen%2C%20Denmark.

3 Steffi Paladini, "How Mars became the prize for the new space race – and why China is hellbent on winning it", *The Conversation* (4 February 2021), <https://theconversation.com/how-mars-became-the-prize-for-the-new-space-race-and-why-china-is-hellbent-on-winning-it-153133>.

The upcoming constellations (above all, Space X's Starlink with its 13,000 planned satellites)⁴ will deploy thousands of satellites with an estimated average of approximately 1,000 satellites being launched every year for the next ten years.

Space as the “fifth dimension”

In parallel with this new dynamism in civil space activities, military space commands have been created in the last several years in a number of established space-faring nations. From the USA to France, from the UK to Italy, space has openly become the “fifth dimension” (next to land, sea, air, and cyber space) of military operations.

On the one hand, the basic technological, mechanical, and operational concepts of space systems have not changed much (a launching base, a rocket, and a payload all submitted to a number of natural and celestial constraints).

On the other hand, the miniaturisation of components, implementation of new materials, and refinement of scientific knowledge have multiplied the number of sectors in which satellites and space-enabled services are key elements. They are being increasingly taken for granted, which makes them a “critical infrastructure” in their own right.

The space race came to epitomise the West–East confrontation during the Cold War. Since the 1980s, this “race” has influenced massive development in the commercial exploitation of space-based systems.⁵ Technologies derived from space applications include telecommunications, Earth observation, Global Navigation Satellite Systems (GNSS),⁶ and recent technologies to provide the ultra-fast connectivity that is so vital to our hyperconnected societies.

The ability to access, occupy, and exploit the space environment, either close to or farther away from Earth's orbit, is an essential element for any global player today to possess. Whether in order to project soft power, to ensure the competitiveness of its economy, to preserve a technological competitive advantage, or to freely and autonomously collect information and intelligence, space is an essential tool, be it for civilian or military purposes.

4 Jeff Foust, “SpaceX launches Starlink satellites and rideshare payloads”, Space News (15 May 2021), <https://spacenews.com/spacex-launches-starlink-satellites-and-rideshare-payloads/>.

5 Dominik Sandbrook, “The Space Race: how Cold War tensions put a rocket under the quest for the Moon”, Science Focus (4 July 2019), <https://www.sciencefocus.com/space/the-space-race-how-cold-war-tensions-put-a-rocket-under-the-quest-for-the-moon/>.

6 European Union Agency for the Space Programme, “What is GNSS?”, <https://www.euspa.europa.eu/european-space/eu-space-programme/what-gnss>.

One space, many resources

The green and digital transitions toward a more sustainable future can be fostered and enabled by space-based systems. Safety and security applications require space-based sensors to monitor the environment, to prevent and mitigate natural catastrophes, or to foresee possible disasters. Inspiring the younger generation and even building a European identity can also rely on positive messages coming from space activities, starting with the European astronauts who have been living and working onboard the International Space Station (ISS) uninterruptedly for over 20 years now alongside their fellow American, Russian, Japanese, and Canadian space explorers.⁷

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Europe has a track record of successful, at times world-class, achievements in space: from the commercial success of the Ariane launchers to the 2014 comet landing with the Rosetta mission.⁸ Europe possibly has the most comprehensive among all the existing systems for monitoring the environment (Copernicus) as well as its own GNSS systems (Galileo).

All this has been possible thanks to pooling the resources—financial, intellectual, and industrial—of many European countries and with the technical and political stewardship of both the EU and the European Space Agency.

Other powers are steadily increasing their efforts, too. China is slowly but surely implementing its space plans, including a space station and mission to the Moon (including launching a human-tended Moon base by the next decade) and Mars, not to mention its development of commercial space systems.⁹ NASA's budget has been raised again to support its return to the surface of the Moon, while American entrepreneurs are investing their efforts and financial wealth into developing new space systems, in part to serve NASA's plans but also to position themselves as global space entrepreneurs.¹⁰

7 NASA, "Space Station Updates", https://www.nasa.gov/mission_pages/station/main/index.html.

8 The European Space Agency, "Rosetta", https://www.esa.int/Enabling_Support/Operations/Rosetta.

9 Jonathan Amos, "China lands its Zhurong rover on Mars", BBC (15 May 2021), <https://www.bbc.com/news/science-environment-57122914>.

10 John Cumbers, "The New Space Race: Meet the Investors Building a New Space Settlement Industry", Forbes (18 February 2020), <https://www.forbes.com/sites/johncumbers/2020/02/18/the-new-space-race-meet-the-investors-building-a-new-space-settlement-industry/?sh=73eef68d6b58>.

European space governance

Europe is endowed with a highly skilled workforce, long scientific traditions, and a robust economy. What it is missing, however, is the political resolve and financial means to keep up with this renewed acceleration in the development of space activities.

Its search for autonomy was at the inception of the decision to develop Europe's own launcher, which has led to the successful development of the Ariane rocket that would also become a commercial success later, mainly thanks to the USA's overreliance on the Shuttle.

Today, as the European Commission declares that strategic autonomy is at the heart of its vision for the future of Europe, space capabilities constitute both a key element and an enabler of this strategic autonomy.

Nowadays, space governance in Europe is articulated on three main levels: the EU and its executive agency EUSPA (formerly GSA), intergovernmental (mainly through the European Space Agency, ESA), and national (through space agencies or other governmental entities). The EU's two flagship programmes (Galileo and Copernicus), funded by the EU MFF, see the involvement of ESA as a space architect or technical implementer. In these programmes, and more generally in the development of a coherent and ambitious European space policy, the countries of Europe, which are in most cases members of both organisations, close a triangle whose efficiency and overall impact could be improved.

ESA was established in 1975 as an intergovernmental research & development organisation to carry out joint space programmes "for exclusively peaceful purposes", but it also aimed at "elaborating and implementing a long-term European space policy" as well as coordinating national programmes as laid down in its Convention.¹¹

Today, ESA is comprised of 22 members (including 3 non-EU countries, namely the UK—whose membership was not affected by Brexit—Norway, and Switzerland). Canada, Slovenia, Latvia, and Lithuania are ESA Associated countries. Two distinct features have allowed ESA to thrive: its flexible programme definition (with optional programmes) and its more controversial "juste retour" principle. The former means ESA member states have the freedom to decide whether and to what extent they will participate in specific programmes. The latter is the guarantee that, ideally, the amount of each member state's contribution will be returned to that country's economy through industry procurement contracts. Some 85% of ESA's own resources are directed to optional programmes, while over 90% of member state contributions are returned to their national industries to develop, manufacture, and operate space missions.

¹¹ The European Space Agency, "ESA's Purpose", http://www.esa.int/About_Us/Corporate_news/ES-A_s_Purpose.

Joining ESA as a full-fledged member requires a country to contribute to the mandatory part of the organisation's activities according to a contribution scale based on national GDP, revised every three years. Despite this "entry ticket", ESA has doubled its members even following the establishment of the EU Space Programme. ESA's industrial policy is a constant balancing act between the imperative of best-value-for-money space procurement and the need to make room for space industries from all member states—possibly with particular regard to high-tech SMEs.

Formal involvement of the EU in space activities dates back to the Lisbon Treaty of 2007. In its Article 189, space was mentioned for the first time in a European Union Treaty as part of the "shared competences". Since then, Member States cannot be prevented from exercising their own competences in the field of outer space.¹² As a matter of fact, the same article excludes "any harmonisation of the laws and regulations of the Member States".

Before that, the EC published a 2003 white paper titled *Space: a new European frontier for an expanding Union; An action plan for implementing the European Space policy*.¹³ This led to the signing of the ESA/EC Framework Agreement as the first attempt to provide a coherent and effective framework for coordination between the two European "space institutions".¹⁴

In these same years, Elon Musk founded Space X and began planning the first flight of his Falcon rocket, whose successors have eventually become the most competitive launchers on the global market; until then, it had been dominated by Europe's Ariane launchers. Elon Musk and other competitors are indeed pressing Europe to re-think and improve the efficiency of its launchers. Ariane 6 (whose maiden flight is now slated for 2022), with its new industrial organisation, is the first attempt to provide a commercially competitive response to Musk's Falcon rocket.

Space governance and next steps

Recent months have seen the arrival of new leaders at the European Commission (Commissioner Thierry Breton), at ESA (Director-General Josef Aschbacher), and in some key countries (for instance, the new French CNES President, Philippe Baptiste).

On 28 April 2021, the EU co-legislators adopted the Regulation for the EU Space Programme, triggering the renaming of the GSA executive agency to EUSPA.

¹² European Parliament, Consolidated version of the Treaty on the Functioning of the European Union, Official Journal C 202 (7 June 2016), Art. 189, p. 131–132, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A12016E189>.

¹³ European Commission, *Space, a new European frontier for an expanding Union; An action plan for implementing the European space policy [white paper]* (Luxembourg: Office for Official Publications of the European Communities, February 2004), <https://op.europa.eu/en/publication-detail/-/publication/65011c3f-5662-4b62-8a94-364a239d12ef/language-en>.

¹⁴ Framework Agreement between the European Community and the European Space Agency, Official Journal L 261 (6 August 2004), pp. 64–68, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A22004A0806%2803%29>.

This new governance and availability of dedicated resources for space programmes are indeed good news. Nevertheless, Europe's overall investment in space systems and technology remains far behind that of the USA and is even lower than that of China.

The newly approved EU Space Programme amounts to €14.8 billion over 7 years (less than the originally proposed €16 billion).¹⁵ Likewise, most national space agencies pass on a portion of their national endowment to ESA in order to carry out cooperative programmes.

A number of challenges lie ahead with heavy implications for our societies and geopolitics.

Space, especially its useful orbits and frequencies, is becoming more and more crowded every day. The number of debris threatens the safety of deployed satellites and the ability to place new ones in certain orbital slots. The arrival of mega-constellations can only make the situation more difficult. A global consensus on a sustainable and sensible use of space is needed.

Europe must act to make its values prevail but also needs to be a credible and respected player that does not depend on any other player for its space-based capabilities.

- The EU needs to be in a position to access space and deploy its space systems autonomously, without depending on any third party. Ariane launchers have enjoyed commercial success for several years. It is indeed important to develop launch systems that are also commercially competitive. However, strategic autonomy requires that access to space is free, and this is a key strategic element for Europe's autonomy and credibility, especially for security applications and commercially sensitive ones.
- More and more frequently, congestion in space poses a threat to orbiting satellites. Europe must possess an autonomous situational awareness (that is, being able to detect and monitor threats in space, be it space debris or a solar storm) to protect its own space assets and be able to weigh in on the discussion of global space traffic management solutions, both regulatory and operational.
- Developing its own secure connectivity for government and public use would represent another brick in Europe's strategic autonomy regarding space, not to mention maintaining Galileo's technological edge and keeping it fully operationally reliable. Despite European ambitions, the resources which have been set aside thus far may not be sufficient.

¹⁵ ESA's yearly budget of 6 billion Euros already includes the EU's yearly contribution of 1.5 billion coming from the 2 billion per year of the EU Space Programme. See European Commission, "EU budget: A €16 billion Space Programme to boost EU space leadership beyond 2020" (6 June 2018), https://ec.europa.eu/growth/content/eu-budget-%E2%82%AC16-billion-space-programme-boost-eu-space-leadership-beyond-2020_en.

Conclusions

These are just a few examples of civilian space assets (albeit of an increasingly dual nature) that are required to achieve serious and credible strategic autonomy, a position for Europe in the world that matches its economic power and projects its values.

Among these, there are the issues of technological components (to break free from US-imposed ITAR regulations), cybersecurity of space, and the ground infrastructure of our space assets. Additionally, Europe should ensure and foster the massive development of a sizeable downstream industry that may exploit the data produced by high-quality European space systems, which are often are exploited by non-European companies.

Europe has the ingenuity, the skills, and the vision necessary to re-gain momentum, fill the gap, and re-position itself as a truly autonomous space power and assert its overall strategic posture.

Decision-makers are increasingly aware of this potential. Let us unleash the resources of our institutions, nations, industries, and SMEs to push forward and win this global contest. A satellite might not be visible in the sky, but the services it allows on the ground can have a huge impact on jobs, economic growth, safety, and resilience in our societies. We cannot allow others to control our communications, to decide where to send our data or which satellites to launch.

Author bio

Piero Messina, born in 1964 in Florence, Italy, is a senior policy & strategy officer in the ESA Director General's Services. He is in charge of relations with Member States and has been working on several strategic cross-cutting projects such as space resources (e.g. space mining, in-orbit economy), the Moon Village vision as well as on enhancing the nexus between space systems and the maritime domain.

Piero has been working at the European Space Agency for over 30 years in several positions and in different ESA Centres (ESOC, Germany, ESTEC, The Netherlands and HQ in Paris). Before holding the present position he was, for several years, chief of staff / advisor to successive ESA Directors of human spaceflight and space exploration. Previously he was part of the managing team of the Aurora European Exploration Programme and the Secretary of its Board of participating Member States.

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