

Space and European Digital Sovereignty

by Ottavia Credi and Camilla Vianini

ABSTRACT

The link between space and the digital world is stronger than ever. Whilst space activities have been influencing different aspects of the everyday life for decades, the growing role gained in the last few years by the so-called American “Big Techs” in the space sector has accelerated a paradigm shift. Both the space and the digital dimensions are critical infrastructures and, as such, they face external threats to their security, which directly affect countries’ national interests. The European Union is working to achieve a stronger digital sovereignty and to safeguard and expand its space capabilities (including an independent access to space). In this context, the Italian industrial sector can offer a valuable contribution to reach such goals. Going forward, it will be important to acknowledge the growing relevance of space, and to pay more attention to such dimension both at the national and European level.

*Space | Digital policy | European Union | Security | Strategic autonomy |
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keywords

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Introduction

Space has become a tangible dimension: most actions and activities taking place on Earth are either directly or indirectly affected by spatial applications. Nevertheless, there continues to be a widespread lack of awareness about their relevance for the everyday life and the need to constantly update a set of capabilities which have a clear influence over numerous aspects of the day-to-day. Beyond the space dimension, it is important to reflect upon digital sovereignty, especially with respect to the European Union (EU). These are the main elements upon which **Michele Nones**, Vice-President of the Istituto Affari Internazionali (IAI), based his introductory remarks, inaugurating a webinar organised by IAI on 26 May 2021, and moderated by **Flavia Giacobbe**, Director of *Airpress* and *Formiche*.¹ The event took place in the context of IAI's partnership with the Institut Français des Relations Internationales (IFRI) and the Deutsche Gesellschaft für Auswärtige Politik (DGAP). The webinar was held as a hybrid event, with some of the panellists physically present at IAI's headquarters and others participating remotely, and was attended by representatives of the Armed Forces, Italian institutions and private industries of the national and European space sector.

1. New actors in space

The first panellist to take the floor was **Jean-Pierre Darnis**, IAI Scientific Advisor, Research Associate at Fondation pour la Recherche Stratégique (FRS) in Paris and author of a paper analysing the issues around which he phrased his presentation.²

¹ For further information, please visit IAI website: <https://www.iai.it/en/node/13336>.

² Jean-Pierre Darnis, "Space as a Key Element of Europe's Digital Sovereignty", in *Notes de l'Ifri*, December 2020, <https://www.ifri.org/en/node/18275>.

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· Report of the webinar "Spazio e sovranità digitale europea" organised by IAI on 26 May 2021.

Darnis began by referencing recent developments in the space and digital domains – first and foremost, the creation of the EU Agency for the Space Programme (EUSPA), a full-fledged institutional novelty. Another recent European creation is Secure connectivity,³ a new programme aimed at creating a constellation of satellites for broadband connectivity, capable of providing communications services for private and public consumers, from both the civil and military sector.

The speaker continued his presentation explaining the evolution of the international framework in the space sector, with special reference to the United States. The American model of access to space has revolutionised the domain, as demonstrated for instance by the new role acquired by private actors such as Space X and Blue Origin,⁴ which are working on cutting-edge projects in the fields of space transportation and telecommunications, respectively through the Starlink and Kuiper programmes.⁵ The United States is not the only major power involved in the space race: China is also programming its own satellite constellation, in order to secure broadband communication and connectivity.⁶ It is likely that the growing Chinese investments in space will be matched by an extensive development of platforms such as Alibaba and Tencent. Such international developments, however, may cause space congestion and a considerable amount of space debris, with an active competition between all the actors involved, as they are trying to secure their use of orbital frequencies – especially those in the lower orbit.

In the past, space had a stable perimeter, and only a limited group of actors was working within this dimension. That changed with the significant investments made by the so-called “Big Techs” in the sector which, together with the integration of the space dimension within the data market, favoured a merger between the space and digital domains. In other words, it is almost as if the digital world is “absorbing” the space dimension. Amazon Web Service offers a suiting example of such phenomenon, as a prototype of integration between the data managing capability and the creation of a global space network for data transmission through constellations.⁷ As emphasised by Darnis, it is important to ensure that such integration with existing telecommunication networks takes place according to the principles of complementarity and subsidiarity.

³ For more information on the Secure Connectivity programme, see: EU Space, *A Multi-Orbital Secure and Resilient Space Connectivity*, 12 January 2021, <https://europa.eu/!wGRY7n>.

⁴ Blue Origin is a company owned by Amazon’s founder Jeff Bezos.

⁵ Starlink is the satellite constellation set up by Space X, currently being launched, aimed at providing global access to broadband connectivity. Kuiper is the Blue Origin/Amazon project aimed at creating a satellite constellation in the Low Earth Orbit, in order to provide broadband connectivity. For further information, visit the Starlink website (<https://www.starlink.com>) and the Amazon website: *Project Kuiper*, <https://www.amazon.jobs/en/teams/projectkuiper>.

⁶ Suitable examples are the Hongyan and Hongyun/Xingyun constellations. For further information, see the NewSpace Index website: *Hongyan (CASC)*, <https://www.newspace.im/constellations/hongyan>; and *Hongyun / Xingyun (Xingyun-2)*, <https://www.newspace.im/constellations/hongyun>.

⁷ For further information, visit the Amazon Web Service website: https://aws.amazon.com/?nc1=h_ls.

The new paradigm presents promising potentialities and numerous implications in the EU framework, too. Despite the high technological level of its current projects, the EU needs to invest more public funds in the creation of an ecosystem in which the Union can compete with other world powers in the spatial data race. Against this backdrop, space becomes part of the debate on technological sovereignty which, according to the panellist, will be a critical element in the future – not just in terms of European economy and strategic autonomy but also, to a certain extent, for the EU's own democratic nature.

2. Geopolitical competition and the role of Italy

Given the increasing attention that NATO and the EU have been paying to space, with both organisations working towards their respective security goals in the sector, it is interesting to consider the approach of the Italian defence institutions towards the space dimension in the European and transatlantic frameworks. Such issues were addressed by General **Luca Capasso**, Head of the General Office for Space (*Ufficio Generale per lo Spazio*) within the Joint Chiefs of Defence Staff and Commander of the Space Operations Command (*Comando Operazioni Spaziali – COS*).

The speaker began by stating that, beyond being a domain of geopolitical competition, space is an enabling environment with respect to the activities that take place on Earth. The average citizen is therefore dependent upon the functions and services offered through the space dimension. Whilst the civil population is mostly uninformed of such dependence, the Italian defence institutions have been well-aware of it for some time. As a matter of fact, for over thirty years they have been resorting to spatial services to conduct command and control tasks through the Armed Forces.

Although space was already a full-fledged operational environment, the 2019 NATO declaration officially labelled it as an operational domain – just like air, land, sea and cyberspace.⁸ Such development encouraged different countries and international organisations to create new commands and institutions, in order to play a more relevant role in the space dimension – in Italy, this translated into the creation of the COS. The need to monitor and control space is a direct consequence of its nature as a critical infrastructure – not only is space useful for defence purposes, but it is also a crucial element for the country's economic and social spheres.

Amongst the issues that spatial actors will have to address in the future, it is important to address the collocation and management of space assets. Leaving aside the geostationary (GEO) orbit, today there is no international regulation governing lower orbits which, however, are already quite “crowded”. The so-called

⁸ NATO, *London Declaration*, 4 December 2019, point 6, https://www.nato.int/cps/en/natohq/official_texts_171584.htm.

mega-constellations⁹ raise a fundamental matter: however vast, the space that can be used for services useful on Earth does have a limit, and continuing to launch satellites into orbits at this rate could potentially lead to a sort of space “Far West”.

The speaker expressed his concern regarding the lack of attention that is being paid to space-related activities, explaining how disregarding this important dimension may lead to negative implications – first and foremost, losing a valuable opportunity for development. It is thus imperative that Italian assets placed in orbits where the country has a strategic interest are monitored and protected, especially from the threat of space debris.

Besides addressing the issue of space traffic management (STM), namely the governance and coordination of satellites’ activities that take place in-orbit, it is important to keep in mind that – unlike aerial traffic – such activities are not regulated by any internationally-recognised authority, and it is thus necessary to counter both intentional and unintentional threats. Currently, all offensive operations conducted in space (such as spoofing)¹⁰ are reversible and below the threshold of deterrence. Deterrence is ensured by satellites’ growing resilience granted by advancements in their technological capabilities, anti-satellite weapons possessed by some countries, and the difficulty to predict the trajectory of a satellite that may get torn down (which discourages attackers from striking, as they may themselves be damaged in the process).¹¹

The speaker concluded his presentation highlighting the need for international legislation enforcing informed and responsible operations in the space domain. Humanity is becoming increasingly dependent on space – unless it shares a set of common rules, though, it runs the risk of losing control of this dimension.

3. Technological and industrial developments in Europe

The Chief Executive Officer of Thales Alenia Space Italia, **Massimo Comparini**, opened the debate on the industrial sector. Addressing a question about the EU’s posture in the new space economy, the speaker explained how space and digital sovereignty are critical elements not only for the evolution of European policies, but also for industrial technological progress.

Both the digital and the space dimensions are enabling and pervasive technological domains: though they might not be fully aware of it, citizens are constantly in contact with space technologies and digital devices. The two domains contribute

⁹ Mega-constellations are satellite complexes, made up of several hundreds to thousands of units.

¹⁰ Spoofing is an attack intended to interfere with the signals emitted from a satellite, with the purpose of confusing and interrupting the transmission of sensitive information.

¹¹ A shot-down satellite might enter a commonly-used orbit and create difficulties for all actors that have assets in the orbit, including the assaulting State.

to the attainment of information about terrestrial activities, both on a global and a local scale, and to the functioning of daily services such as financial and mobility operations. Such information is relevant not only at the strategic-military level, but also for other realms, such as the scientific and environmental field, as demonstrated by the dual programme Cosmo-SkyMed.¹² With reference to Gen. Capasso's remarks, Comparini emphasised the role of the space and digital domains as critical infrastructures which need to be supervised and protected.

The connection between the space and the digital domains is destined to grow in the future. Yet, the space infrastructure is experiencing a considerable transformation: besides being conceived as a means towards technological development, more attention is being paid to its enabling nature. The entangled relation between space and digital will increasingly contribute to generating massive quantities of information, which will be based on Big Data of different volumes and natures.

Satellite transmission is becoming more and more instrumental for data flow. Such transmission mainly occurs through satellites in the GEO orbit, which have always been pivotal for national security thanks to their application in Italian and European defence activities. Through the infrastructure created by satellite communication, it is possible to combine and enhance services provided, for instance, by Earth Observation and satellite navigation, allowing the geolocalisation of specific areas of the planet and the attainment of near-real time images. Since the production of data on space and digital assets is a critical service, cyber protection instruments should be applied to secure these infrastructures against the unauthorised access of malicious actors.

Concerning the merger of the digital and space domains, the know-how within the space sector continues to be rather difficult to attain, except by the well-known international IT players. In other words, the integration of the space dimension in the digital domain through industrial operations is facing some difficulties. This is where the issue of European digital sovereignty comes in: through the European Commission and the European Space Agency (ESA), the EU is taking on the creation of digital infrastructures and models, such as the Gaia-X project.¹³ Referencing the second generation of the Galileo programme,¹⁴ Comparini expressed his confidence towards the implementation of the EU's space programmes, highlighting the competences and technologies already available in these domains.

¹² Cosmo-SkyMed is a dual Earth Observation constellation of currently five satellites, for civil and defence purposes, developed by Thales Alenia Space for the Italian Space Agency and the Ministry of Defence.

¹³ Gaia-X is a European project devoted to the creation of cloud services and data centre. For more information, please visit the official website of the project: <https://www.data-infrastructure.eu/GAIA-X/>.

¹⁴ The European GNSS programme Galileo will be evolved into a second generation of satellites, which will be manufactured also by Thales Alenia Space Italia. More information on Galileo is contained in the next paragraph; for more information on the second generation of the programme, please visit the ESA website: *Galileo Second Generation*, https://www.esa.int/ESA_Multimedia/Images/2021/05/Galileo_Second_Generation.

The speaker concluded his speech with a remark on new space economy. Private actors are gradually transforming the space landscape through a series of investments, projecting their influence over the European industrial and policy sectors. The general involvement and openness towards start-ups in the space value chain – also demonstrated by the ESA – encouraged a progressive paradigm shift in terms of speed and implementation of innovation. An additional element which will likely favour technological innovation consists in the federation of financial instruments coming from European Member States. Overall, the EU has everything it takes to play a relevant role in the space sector and become a protagonist in the merging between the space and digital domains.

4. Europe and the Moon

The CEO of Telespazio Italia, **Luigi Pasquali**, addressed downstream activities, namely the acquisition, diffusion and transformation of spatial data into accessible information. There is a wide variety of space data, ranging from space debris monitoring to information gathered for scientific experiments. According to some studies,¹⁵ citizens living in developed countries are exposed to space assets 30 times a day on average – yet, there continues to be a widespread lack of awareness concerning these systems.

Data acquired to study other celestial bodies will be essential for the return of crewed missions to the Moon, currently expected before the end of this decade. At the moment, the ESA and NASA are working on missions aimed at obtaining the instruments and infrastructures needed to support future operations on the Moon, including connectivity, communication and geolocation systems. These assets will thus have to ensure a satisfying level of operativity and sustainability to humans and machines which will operate on the Moon, starting with remote-controlled autonomous rover systems.

The ESA formed consortia of European industries which will study the most suitable solutions for the new era of Moon exploration. Their proposals will be presented at the ESA Ministerial Council in 2022, during which participants will define investments priorities. The Italian industrial sector – represented by Telespazio, Thales Alenia Space and several other SMEs – is proving to be up to the challenge and ready to take on a prominent role in this process.

The EU has been working on two programmes aimed at achieving strategic autonomy in space. The first one is Galileo, the Global Navigation Satellite

¹⁵ The speaker explicitly referenced a study by Scott Shearer, “British Business Bank Partner Seraphim Capital Launches Pioneering Space Tech Fund”, in *British Business Bank News*, 21 November 2016, <https://www.british-business-bank.co.uk/british-business-bank-partnerseraphim-capital-launches-50m-pioneering-space-tech-fund>.

System (GNSS) advanced programme which granted Europe independency from the American GPS service. The second one is Copernicus, an Earth Observation programme which was first designed to disseminate free and accessible data at a global level, but was then re-oriented towards the goals of digitalisation, sustainability and technological sovereignty for Europe.

In order to increase its space situational awareness in the era of downstream, Europe needs to improve its governance in the space sector, implementing a better management of future programmes in this domain. Against this backdrop, the second generation of the Galileo satellites is aimed at granting Europe its independence in the space dimension, and is now being backed up by new industrial solutions, such as quantum communications for a more resilient cybersecurity.

The panellist concluded his session with a reference to the activities carried out by Telespazio, outlining a series of best practices from which the EU could benefit. For instance, in order to increase its technological autonomy in the monitoring of satellites, the EU will need to upgrade its ground system, invest in innovative technologies such as sensors able to identify threats in space, and automate orbit manoeuvres.

5. Towards a more competitive Europe

As highlighted by the President of the Italian Space Agency (ASI), **Giorgio Saccoccia**, the global competitiveness of the European space industry is a key element in the run towards digital sovereignty. Over the years, Italian and European institutions demonstrated a growing interest in the space sector, in the wake of the widespread acknowledgment of the relevance of this domain with respect to the digital dimension. This resulted in the agreement over the common goal of strengthening European technological and digital sovereignty, also given the link between these domains and future challenges which Europe will inevitably have to face, such as climate change. Still, there continues to be a certain degree of uncertainty over the precise responsibilities of each institution involved in the achievement of this objective.

Today, the value of technological stocks in the United States is higher than that of the entire European stock market. Therefore, the EU needs to increase its engagement in the space sector, keeping in close consideration the features characterising the European market, starting with its competitiveness. Such element stems from a historical and delicate balance between competition – stimulated by the existence of several highly specialised companies – and collaboration – inspired by the need for coordinated investments, technological advancements, and attainment of capabilities developed on a continental scale. The ESA is a virtuous example of such model, as it includes 22 countries working on common projects aimed at providing the best possible products for European technological advancement.

An increase in resources and investments is not enough to achieve the goal of a more competitive European space sector on a global scale: it needs to be matched by an internal competition which will favour an upgrade of research and innovation in the industrial sector. The EU should continue to develop its competences and know-how, also benefitting from opportunities such as the Recovery Fund.

6. Watchword: Access to space

Vice-President of ArianeGroup, **Morena Bernardini**, contributed to the debate addressing the new space economy revolution, characterised by the close connection between the space and the digital dimensions endorsed by the Big Techs.

NewSpace had a radical impact on the ways to achieve access to space. In order to maintain a certain degree of autonomy in this dimension, Europe needs its own independent access. Mega-constellations and space exploration require a technological and industrial upgrade in launch capabilities, which are instrumental to accelerating the orbit positioning of European constellations.

At the moment, all global space powers are pursuing projects on satellite constellations, whose business models match governmental and commercial connectivity services. Technological innovation – starting from miniaturisation¹⁶ – and large satellite constellations are game-changers for the space sector as a whole. This is especially true for launch providers, some of which are capable of orbiting many satellites with a single launch, increasing the launching cadence and benefitting from economies of scale. Against this backdrop, launch service providers represent an essential component for autonomous access to space.

Europe has two categories of launchers: Vega¹⁷ and Ariane, which has now come to the sixth series evolution.¹⁸ Thanks to the flexibility granted by the Vinci engines,¹⁹ which are able to reignite in orbit, European launchers can operate refurbishment launches, thus meeting market demands. Yet, Europe will have to accelerate its ongoing programmes in order to reach technological sovereignty in the space domain.

¹⁶ Miniaturisation is a process aimed at making satellites smaller and lighter, so that they require less energy and lower launch and production costs.

¹⁷ For more information about the Vega launcher, see ESA website: *Vega Launcher*, https://www.esa.int/Enabling_Support/Space_Transportation/Launch_vehicles/Vega_launcher.

¹⁸ Ariane 6(2) and 6(4) are the new configurations of the European launcher that will transition in 2021 to substitute Ariane 5. For more information, see Arianespace website: *Ariane 6*, <https://www.arianespace.com/ariane-6>.

¹⁹ The Vinci, which are part of the Ariane 6 equipment, are liquid propellant engines able to reignite in the launcher upper stage, giving maximum flexibility to the launch service. For more information, see: ArianeGroup, *Ariane 6 Vinci Engine: Successful Qualification Tests*, 22 October 2018, <https://www.ariane.group/?p=8784>.

Conclusions

Ranging from the role of the Big Techs, to geopolitical competition, to orbital congestion, the webinar investigated the issues of space and European digital sovereignty from different perspectives, stimulating the public's interest and encouraging extensive participation.

The impacts of space operations, their implications on terrestrial activities, and their very nature of critical infrastructures demonstrate the relevance of this dimension. By investing in programmes devoted to the innovation and development of the space dimension, Europe will be able to expand its autonomous use of space, its independent access to this domain, as well as its level of digital sovereignty. Against this backdrop, the Italian industrial base can be instrumental in providing Europe with the necessary instruments to play a relevant role on the international scene.

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- 21 | 11en Ottavia Credi and Camilla Vianini, *Space and European Digital Sovereignty*
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- 21 | 10 Marietta S. König and Liliya Buhela, *The OSCE Asian Partnership: Developments and Thematic Priorities*
- 21 | 09 Ester Sabatino (a cura di), *La collaborazione italo-britannica nel settore della difesa e sicurezza dopo la Brexit*
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