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NATIONAL SPACE STRATEGY 2025 — 2040

Preface

There are achievements that permanently reshape the destiny of nations. Space is one of them. For more than half a century, it has been both the mirror and the horizon of our power. Mirror, because it reflects our ability to understand, innovate and cooperate. Horizon, because it opens the way to a future that we want to be free, sustainable and controlled.

Today, space is no longer just a field of exploration: it has become a domain of sovereignty, innovation and security. Our communications, our observation of the Earth, our defence, our scientific knowledge, our digital economy — almost everything now depends on space infrastructure. What was once the dream of pioneers has become a feature of everyday life, a pillar of our independence, an essential dimension of our power.

However, our space is changing. It has become a conflict zone in its own right, where our adversaries now have military capabilities that could threaten our sovereign interests. Driven by technological breakthroughs, international competition and the climate emergency, a new era is dawning, one of extraordinary opportunities and unprecedented risks. The reuse of launchers, the miniaturisation of satellites, constellations, in-orbit services and the proliferation of players are disrupting the balance of the sector. For our fellow citizens, for the nation, from the mobile phone in their pocket to the missiles in the sky, space is the new frontier of our independence.

Faced with these upheavals, France cannot afford to be a spectator. Together with Europe, it must be a leading space power, capable of protecting, defending, innovating and cooperating. To leave space is to leave history.

That is why, to safeguard our independence, I wanted to chart a collective course with this national space strategy. It extends the guidelines of the National Strategic Review and the defence space policy. It sets out a clear ambition: to ensure France and Europe have autonomous, sustainable and competitive access to space; to build a sovereign industrial and technological base; to strengthen the resilience and security of our space infrastructure based on the principle of "active defence"; to support scientific excellence, training and innovation; and to promote open and responsible European space diplomacy.

It is a project of sovereignty, because without military capability, without launchers and industry, there can be no space power.

It is a project of science and knowledge, because understanding the universe, the Earth and the climate means informing our decisions and preparing for the future.

It is a project of cooperation and peace, because France believes in a European space sector grounded in its values and committed to the responsible and sustainable use of shared space.

We have the assets required: a history of pioneers, outstanding researchers, exceptional engineers, an innovative industry and an ecosystem that brings together talent from the public and private sectors. Alongside our historic prime contractors, a new generation of entrepreneurs, engineers and scientists embodies this renewal of the French space industry: bold, agile and European. Together, they form a true **French space team**, united by the same demand for excellence and sovereignty.

We also hold the conviction that power is not measured solely by its ability to dominate others, but by its ability to overcome collective challenges for the benefit of all. Space must be that realm of shared human hope, driving progress, transmission and protection of universal treasures. This is where France, faithful to its vocation of balance and progress, must continue to lead the way.

And this is the promise embodied in this strategy: that of a France and a Europe sovereign in space, responsible on Earth, and focused on the future.

Emmanuel Macron

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Executive summary

THIS STRATEGY AIMS TO BRING TOGETHER ALL STAKEHOLDERS, PUBLIC AND PRIVATE, ESTABLISHED AND EMERGING, TO BUILD A *FRENCH SPACE TEAM* AT THE SERVICE OF A SOVEREIGN AND COMPETITIVE EUROPE.

At a time when the global space ecosystem is undergoing rapid and profound change, new private players are transforming the market, uses are multiplying, space is becoming increasingly militarised and technological competition between major powers is intensifying, France is asserting a national space strategy that matches its ambitions for sovereignty, power and responsibility.

It sets a clear timeline towards 2040, with the aim of guaranteeing French and European sovereignty in space by ensuring autonomous access to space, strengthening industrial and scientific competitiveness, consolidating the resilience of space capabilities, and affirming France's leading role within a sovereign European space programme.

(Pillar 1) Guarantee autonomous, sustainable and strategic access to space

Access to space is the foundation of all space sovereignty. It relies on complete control of the launch chain, from the design of launchers to the operation of the **Guiana Space Centre (CSG),** Europe's spaceport and a strategic infrastructure for France.

Ensuring this autonomy implies **the continued operation of Ariane 6**, whose competitiveness must be substantially improved (Strategic Objective 1), while modernising the CSG and adapting its governance to the growing diversity of stakeholders and the emergence of new industrial models. In an international environment profoundly transformed by the industrialisation of space, France is already preparing the technological building blocks that may be necessary for the next generation of space access systems, which must have a viable economic model. This generation will therefore be based on: **reuse, cost-effective propulsion and high-thrust engines** (Strategic Objective 2).

(Pillar 2) Act in favour of an integrated and competitive European space economy

French and European space power is based on a leading industrial and technological base, which must now adapt to a rapidly changing market.

France wants to consolidate an **integrated and competitive satellite industry**, bringing together established players and new entrants, based on innovation, responsiveness and European cooperation. This ambition requires identifying, in conjunction with European partners and the industrial ecosystem, the technologies that are critical for sovereignty and scientific excellence, but also for the competitiveness of the sector, which is necessary for its survival. The associated economic models will also need to be aligned at European level so that they can be defended collectively in an increasingly competitive global market and enable Europe to maintain its strategic autonomy in space. The CNES will be a key player in the ecosystem. (Strategic Objective 3).

At the same time, the valorisation of **space data** will become a major strategic focus: the State will develop a **national space data policy** aimed at simplifying access, stimulating service innovation and strengthening governance of downstream services, in line with European programmes (Copernicus, Galileo, IRIS^2) (Strategic Objective 4).

Finally, France will adopt a **national space skills policy** by 2040, designed to anticipate needs, structure regional training provision, perpetuate the best projects from France 2030 and maintain the scientific and technical excellence that underpins our sovereignty (Strategic Objective 5).

(Pillar 3) Strengthen the security, defence and resilience of space systems

Space has become a military domain in its own right and a critical pillar of national sovereignty. Space systems are now essential to the functioning of institutions, the armed forces and the economy. They must be protected against natural, accidental or intentional threats to their integrity.

France will implement the **national resilience strategy to critical space infrastructures**, in order to guarantee the continuity of essential orbital services, including in the event of a major crisis (Strategic Objective 6).

It will strengthen its **military capabilities from space**, particularly in the areas of intelligence, early warning, communications and positioning, through more resilient, distributed and interoperable architectures (Strategic Objective 8).

It will also consolidate its **space surveillance and capabilities (SSA/SST)** capabilities in order to guarantee its autonomy of assessment and decision-making, and will develop a **national capacity for active defence in and towards space**, which will be graduated and diversified, in accordance with international law, in order to prevent, deter or neutralise any threat to its national interests (Strategic Objective 9).

(Pillar 4) Pursue scientific and exploration ambitions commensurate with the challenges

Space remains a privileged field of innovation, knowledge, prestige and global scientific standing. France and Europe must maintain their capacity to participate in **human spaceflight**, a lever for technological power, scientific prestige and collective inspiration, while redefining the frameworks for international cooperation (Strategic Objective 10).

France will strengthen its contribution to **Earth sciences from space**, in the service of ecological transition, sustainable resource management and climate resilience (Strategic Objective 11).

Finally, France will pursue an **ambitious policy in space sciences**, consolidating its international partnerships, supporting centres of excellence and mobilising national research to prepare for the major missions of tomorrow (Strategic Objective 12).

(Pillar 5) Assert an integrated international strategy that serves French and European interests

While international trends and largely unregulated practices tend to destabilise the use of space, France will pursue an **active regulatory agenda** to ensure the safe, secure and sustainable use of space, in line with national and European sovereignty issues (Strategic Objective 13). In particular, it will defend equitable access to orbital and frequency resources in accordance with international rules and the multilateral framework. These resources are essential to digital sovereignty and the competitiveness of the European satellite industry.

It will advocate for **clarification of European space governance**, entrusting political leadership to the European Union and technical project management to the ESA, with the central objective of consolidating European space power and competitiveness organised around the necessary Franco-German-Italian alignment (Strategic Objective 14).

It will develop **targeted extra-European cooperation**, with a view to diversification and burden-sharing, and will support **proactive economic diplomacy**, aimed at supporting French space industry exports, including emerging New Space players (Strategic Objective 15).

This combination of regulatory ambition for the benefit of all, strategic cooperation and industrial competitiveness should enable France to strengthen its capacity for action on the international stage while consolidating the cohesion of the European space model.

Diagnostic

FRANCE IS A RECOGNISED SPACE POWER, RENOWNED FOR ITS SCIENTIFIC EXCELLENCE AND ITS DUAL CIVIL-MILITARY INDUSTRIAL MODEL

Europe is a global economic power with an internal market of around 450 million consumers and an economy representing around 15% of global GDP[1]. This fundamental fact must be kept in perspective when considering its status as a space power. It has a highly developed industrial base, mastering most of the world's most advanced space technologies, as well as world-class sovereign space infrastructure.

France's contribution to this achievement is considerable and is based on a long-term effort in support of the space sector. In 2025, France holds the largest public space budget in Europe and the second largest in the world per capita. France's total public space budget amounts to around **€3 billion** per year, or **€47 per capita**, behind the United States, whose NASA civil budget alone amounts to around $25 billion, ($75 per capita)[2], and well above the European average of around €12 billion (€26 per capita)[3].

A leading space industry

The European space industry is built on a foundation of technological excellence, enabling it to master nearly all the critical capabilities needed for autonomous access to space and for conducting missions across all orbital domains. Companies across the continent design and operate space systems spanning a broad spectrum of civil, commercial and defence missions, with performance recognised among the world's best.

Within this landscape, France occupies a unique position: it accounts for around half of the European space industry's turnover and nearly one-third of its workforce[4], making its sector the leading space industry in Europe in terms of both employment and revenue. This complete ecosystem covers the entire value chain: launch and satellite operators; launcher and satellite prime contractors; equipment manufacturers; providers of services based on space-derived data; and a dense network of innovative SMEs.

This industrial strength is now being enhanced by a cohort of emerging companies: the *France's "New Space"* sector. These new players, often originating from public research or digital technologies, are now active across all space segments and are bringing agile, responsive and innovative solutions that are revitalising the sector's momentum. Supported by France 2030, this generation of companies is helping make France one of the most complete space ecosystems in the world, where start-ups, laboratories, major prime contractors and public bodies are jointly inventing the space sector of tomorrow.

World-class sovereign space infrastructure

Located in Kourou, French Guiana, the Guiana Space Centre (CSG), Europe's primary spaceport, is one of the most efficient launch bases in the world. Its geographical position, close to the equator and open to the Atlantic Ocean, allows it to reach multiple orbital inclinations and optimises launch performance, while its industrial, logistical and technical infrastructure places Europe at the highest international level.

[1] Eurostat, *Key figures on the EU in the world – 2025 edition*. | link
[2] NASA FY 2024 Spending Plan, $24,877 million (September 2024) | link
[3] ESPI, *Space Sector Statistics 2023*. | link
[4] Eurospace: *Facts & Figures - The European space industry in 2023*, July 2024 - link

A true pillar of autonomous access to space, the CSG is both a strategic asset for Europe and an essential element of French sovereignty. Located on national territory, close to the equator and the coast, it guarantees France the ability to launch its civil and military satellites under conditions of maximum performance and safety. A sovereign network of ground stations spread across several continents completes this system, ensuring continuity of links and control with launchers and satellites in orbit.

European space systems stand out for their reliability and performance, recognised among the best in the world. They have enabled Europe to establish a lasting position in commercial launch and satellite telecommunications markets. The European programmes **Galileo**, the European satellite navigation system, and **Copernicus**, the European Union's Earth observation programme, are the most emblematic examples: with more than four billion users, Galileo is now the world's most accurate satellite positioning system — including a secure signal reserved for government use, the Public Regulated Service (PRS) — while Copernicus provides the most comprehensive and reliable environmental data on the state of the planet.

European technological excellence is also evident in its contribution to major international missions, whether NASA's Artemis lunar programme or projects led by the US Space Development Agency. European components have been selected for these programmes due to their reliability and performance. These collaborations confirm the global recognition of European expertise, including in strategic areas such as defence.

Beyond these major programmes, European success is based on a complete industrial chain capable of designing and producing some of the most advanced subsystems in the world: star trackers, high-precision antennas, service modules, propulsion systems, satellite platforms and new-generation optical technologies. The entire sector, from prime contractors to equipment manufacturers, contributes to the influence of European space technology on the American, Asian and international markets.

This technological expertise also forms the basis for French defence space capabilities, illustrating the fruitfulness of the dual model that characterises the national sector, where civil and military developments reinforce each other.

Mastery of the most demanding space operations

In December 2021, an Ariane 5 rocket, the emblem of European launch capability, placed the *James Webb Space Telescope* (JWST) of the US Space Agency (NASA) into orbit with exceptional precision. Beyond the remarkable performance of the launcher and the teams that operated it, it was Europe's credibility in the field of launch services that led a major foreign space agency to choose a European launcher for a particularly emblematic mission.

Other European successes in space operations preceded this Ariane 5 flight. The five missions of the **ATV (*Automated Transfer Vehicle*)** cargo spacecraft, carried out between 2008 and 2015, resupplied the **International Space Station (ISS)**, delivering nearly three times more freight than their Russian counterparts of the time. These operations, conducted from the CNES space centre in Toulouse confirmed Europe’s mastery of rendezvous and docking manoeuvres with an inhabited orbital platform.

NASA’s Mars exploration missions provide another example showcasing European, and particularly French, expertise. The main scientific instruments on several US rovers, designed in France, are operated from Toulouse by CNES teams, who oversee their operation and the interpretation of data transmitted from Mars.

In 2014, after ten years of travel and more than 510 million kilometres covered, the European Rosetta probe marked a major milestone in the history of space exploration by releasing the Philae lander, which touched down on the comet *Churyumov-Gerasimenko*, known as "Chury". This mission was a world first in comet exploration.

France also demonstrates its expertise in orbital operations by providing the European Union with the Caesar (Collision Avoidance and Surveillance for European Assets in Space) service, which detects and prevents the risk of collisions between satellites.

A strong scientific standing

The quality, reliability and performance of French scientific instruments used in space missions are now world-leading and widely recognised as such. This excellence regularly leads international agencies, particularly NASA, to select instruments designed in France for their most ambitious projects.

French instruments have thus been selected, following international competitions, to equip the two *Mars rovers,* Curiosity and *Perseverance*. They have profoundly transformed methods of Mars exploration by remotely determining the atomic composition of rocks using laser shots, combined with a spectrometer that analyses the light from the plasma thus created. The *InSight* Mars lander also carried a French-designed seismometer, the true scientific core of the mission, and the first instrument in the world to have recorded Marsquakes, revealing the internal structure of the Red Planet.

In oceanography, the historic cooperation between the French National Centre for Space Studies (CNES) and NASA on the Topex-Poseidon, Jason and SWOT (*Surface Water and Ocean Topography*) missions is unrivalled on a global scale. These programmes, dedicated to measuring the topography of oceans and continental waters, illustrate France's ability to design and operate precision instruments for Earth and climate science.

Space sciences have long been a field of excellence for Europe. The Giotto probe achieved a world first in 1986 by flying past Halley's Comet. The Herschel and Planck missions subsequently marked major milestones: Herschel was the first satellite to observe the full spectrum of far-infrared radiation, while Planck made it possible to measure the cosmic microwave background, whose temperature is around 2.7 Kelvin. The unprecedented precision of its instruments, reaching a few hundredths of a Kelvin above absolute zero, provided humanity with an extremely faithful image of the Universe as it was in its infancy.

More recently, the JWST space telescope — the most sophisticated observatory ever built — carried a French instrument, MIRI (Mid-InfraRed Instrument), which has been at the heart of many major discoveries. Since 2013, the Gaia satellite has been mapping the Milky Way with unrivalled precision, providing the international scientific community with unique data, processed in particular at the CNES in Toulouse.

These numerous scientific space missions, to which France makes a decisive contribution, are testament to the vitality and international influence of its research. French instruments, often at the forefront of global innovation, regularly receive international distinctions and awards, confirming France's leading role in Earth and space sciences.

A decisive military power for our defence, dual-use by design

The French space ecosystem contributes directly to national military power: space capabilities are an essential, often invisible, pillar of our strategic autonomy. For several decades, space has played a decisive role in the French authorities' autonomy in assessing situations, making decisions and taking action.

Space-based defence systems now cover all critical functions: the **Syracuse** secure telecommunications satellites, the **CSO** optical observation satellites (Optical Space Component, successors to the Helios series), the **CERES** electromagnetic intelligence satellites (Space-based Electromagnetic Intelligence Capability), as well as future space-control and early-warning systems, all contribute to ensuring France's freedom of action across different operational domains. Mastery of space is thus a vector of anticipation, resilience and efficiency, which strengthens the coherence of our strategic posture and the ability of our forces to fulfil their missions.

The French space ecosystem is also distinguished by its structural duality: the technologies, infrastructure and skills developed for civil and commercial uses feed into military capabilities, and vice versa. This interaction between the two spheres, civil and defence, is a unique asset that ensures the robustness, innovation and sustainability of the sector.

France has also taken full account of the evolving nature of conflict in space. In 2019, it adopted a dedicated **Defence Space Strategy,** affirming an active defence posture and creating the **Space Command (CDE),** the first structure of its kind in Europe. The declaration of its **initial operational capability** in November 2025 symbolises this step-up in capacity.

The year 2024 marked an important milestone, with the conduct of a joint French-US operation in the field of space defence, illustrating France's credibility as an experienced, committed allied partner. The development of the **YODA** demonstrator (*eYes in Orbit for an Agile Demonstrator*), intended to test action manoeuvres in geostationary orbit, reinforces this momentum and confirms France's position as a European pioneer in the field of defence space activities.

A diplomatic tool and a source of influence for France

Space is also a major lever of diplomacy, used as such by all the major powers. In this field, France has been a driving force for decades, recognised by all its international partners. Since its creation, the CNES has maintained close cooperation with the United States and Russia, laying the foundations for an open, balanced and cooperation-oriented French space policy.

Today, the CNES is the space agency that collaborates with the largest number of partners around the world. In addition to its iconic cooperation with the United States in the fields of Mars exploration and space oceanography, France is conducting joint programmes with India, Japan, China, the United Arab Emirates (UAE), Israel and several other emerging nations in the space sector. These collaborations cover scientific research and Earth observation as well as communication technologies, space traffic management and the training of engineers and researchers. The Space Command in Toulouse also hosts **NATO's space centre of excellence,** which ensures operational and doctrinal cooperation to optimise the alliance's capabilities.

This ability to pair technical excellence with international openness gives France a distinctive role as a space power engaged in dialogue. Through the quality of its partnerships and the credibility of its expertise, it helps shape major global scientific and technological programmes and promote scientific progress.

In an highly dynamic international ecosystem marked by major technological and industrial disruption, France's space sector must adapt

The global space sector is undergoing unprecedented transformations, marked by the arrival of new players, the acceleration of technological cycles and the emergence of disruptive economic models. In this changing landscape, France and Europe must adapt their strategies to maintain their status as space powers.

Despite a clear desire to increase investment at European level in the EU's next multiannual financial framework (MFF), the resources allocated remain significantly lower than those mobilised by other major powers, in both the civil and military fields. In particular, Europe devotes far fewer resources to defence than its competitors, resulting in capability gaps and structural dependencies. These weaknesses are exacerbated by governance that still needs improvement and **persistent differences between Member States on the concept of strategic autonomy and "European preference"**.

An underfunded space sector and industrial players in difficulty

As highlighted in the Draghi report (2024)[5], Europe's space sector suffers from a structural funding deficit compared to its competitors. European public investment in the space sector amounted to approximately **$13 billion** in 2023, compared to **$73 billion** in **the United States**[6]. In the military sector, the gap is even more pronounced: the United States will spend **$37 billion** on defence space programmes in 2022[7], compared with **less than $3 billion** for the whole of Europe. In terms of gross domestic product, European space expenditure represents around **0.06% of GDP**, four times less than that of the United States[8].

Private investment is showing modest growth: approximately **$4.7 billion** was raised in 2024 for the space sector in Europe, compared to $1.6 billion in 2023.[9] New European entrants to New Space generally manage to raise funds in the seed phase, but then struggle to finance their scaling up and industrialisation. This **weakness in private equity** penalises young companies, forcing them to seek the financing necessary for their growth outside Europe, with consequences in terms of sovereignty.

European research and development (R&D) efforts also remain modest, averaging around **€2.8 billion per year** over the period 2020-2023, compared to **€7.3 billion** in the United States[10]. This budgetary weakness is compounded by the lack of an overall vision of long-term priorities, which results in fragmentation and dispersion of R&D projects.

The accumulation of these factors over several years has weakened the competitiveness of European industrial players. In a global market that has become highly competitive, many of them are now facing difficulties, particularly in segments where innovation and responsiveness are crucial: **launchers, telecommunications satellites, and emerging in-orbit servicing technologies**.

Dependencies and capability gaps in relation to non-European countries

The European space industry now provides Europe with the vast majority of the capabilities it needs and remains at the state-of-the-art in most areas. However, there is still a persistent dependence on non-European suppliers for certain complex digital components that are essential for the production of high-performance and competitive space systems, such as reprogrammable processors (FPGAs) and silicon components.

The United States and China also maintain an advantage in several strategic areas. Their industries are already active in key sectors of sovereignty and competitiveness — connectivity mega-constellations, super-heavy or reusable launchers, micro and mini launchers, in-orbit servicing satellites, and quantum space telecommunications — for which there are not yet any European equivalents. Forthcoming technological disruptions by 2040 could further marginalise Europe's space sector and call for ambitious European decisions to safeguard long-term space sovereignty.

[5] "The Future of European Competitiveness", European Commission, September 2024 | link
[6] Euroconsult, *Government Space Programs - 2024, Novaspace, 2024.* | link
[7] Euroconsult, *Space Defense Markets: Trends and Forecasts 2023-2032*, Novaspace, 2023. | link
[8] OECD, *The Space Economy in Figures: Responding to Global Challenges*, OECD Publishing, Paris, 2023. | link
[9] Novaspace figures
[10] ESA (2021-2023), *Annual Reports*; NASA, *FY 2023 Budget Justification - R&D and Technology Accounts.* | link ; link

Space infrastructure is also more developed there: these two countries have several launch bases capable of operating all types of launchers, from super-heavy to micro launchers, while Europe still has only a limited number. Similarly, their sensor networks for space surveillance are more extensive, leaving Europe largely dependent on the United States in this area.

Lastly, military and dual-use space capabilities illustrate a particularly significant gap. The United States operates around 350 military satellites and China around 500 dual-use satellites, compared with only a few dozen for Europe, and the gap is widening rapidly. European dependence on the United States for early-warning capabilities remains, at this stage, absolute.

Sub-optimal European governance of space affairs

The governance of European space affairs remains complex and sometimes insufficiently transparent. It is based on coordination between several institutions — the European Union (EU), the European Space Agency (ESA) and the European Union Space Programme Agency (EUSPA) — whose roles were specified in 2021 in the Financial Framework Partnership Agreement (FFPA, EU-ESA agreement).

This framework provides for a clear division of responsibilities: strategic steering is the responsibility of the European Commission, technical development is the responsibility of the ESA, and operational exploitation is the responsibility of the EUSPA. The Galileo (satellite navigation) and Copernicus (Earth observation) programmes, which are already in operation, as well as the future IRIS^2 (Infrastructure for Resilience, Interconnectivity and Security by Satellite) programme, are examples of this. Launchers, which are still mainly developed under ESA project management, are intended to be part of a fully European framework.

While this shared governance has led to significant scientific and technological successes, it is now showing its limitations in the face of a rapidly accelerating global market. The ESA's historical model, based on the principle of geographical return, has contributed to the development of expertise in many Member States, but it is now proving unsuited to current industrial competition. The fragmentation of funding, the duplication of efforts and the selection constraints imposed on prime contractors reduce the responsiveness and competitiveness of European industry.

As highlighted in the Draghi report, this system, which was once a factor of cohesion, is now characterised by its economic inefficiency.

To strengthen the standing of the European space sector, two developments appear necessary: affirming the European Union's strategic leadership in the governance of the sector, particularly for the management of dual-use programmes (IRIS^2, EOGS, etc.), and adapting the principle of geographical return by supporting ex-post application for certain programmes where appropriate in order to promote the competitiveness, coherence and performance of the European space ecosystem.

Anticipate developments in the space sector between now and 2040 to consolidate Europe and France's position in the space sector

Attempting to project what the space sector will lokk like in 2040 remains inherently uncertain, as the last fifteen years have been marked by rapid and often unexpected upheavals. Between 2010 and 2025, technological, economic, geopolitical and industrial disruptions have profoundly transformed the balance of the sector. However, certain major trends are emerging and are already shaping the future of space: intensification of uses, growth of rivalries, accelerated industrialisation. These dynamics are not only likely to continue, but also to intensify on a global scale between now and 2040.

By 2040, space will be an essential pillar of prosperity, resilience and security for modern societies. Geospatial data, global connectivity, synchronisation of critical networks, Earth observation, defence services: the dependence of all human activities on applications using space-based data is a reality that will only increase.

At the crossroads of scientific, economic, military and climate issues, space will become an infrastructure that is both invisible and omnipresent. Its growing convergence with the digital sector will make it an integral part of the global data network. This evolution is already under way: Amazon's Kuiper constellation project, launched to provide universal access to the cloud, illustrates this trend towards the convergence between space and digital ecosystems, supported by investments amounting to several tens of billions of euros.

An environment that has become commonplace, yet remains strategic and a theatre of unrestrained conflict

Space has now become an active operational environment, characterised by genuine conflict dynamics. A true force multiplier, it makes it possible to overcome distance, ensure near-instant global connectivity, and coordinate military effects across all domains of operation.

The military use of space systems will become even more commonplace, and orbital infrastructures could be targeted as full-fledged military objectives. They must therefore be capable of being defended in compliance with international law and France's commitments. This evolution is accompanied by rising levels of confrontation below the threshold of open conflict, marked by a growing number of unfriendly or hostile actions — anti-satellite missile tests, jamming, cyberattacks, sabotage or directed-energy weapons — aimed at imposing a balance of power based on ambiguity and confusion. Some powers are even increasingly tempted to free themselves gradually from existing international legal frameworks.

At the same time, the widespread use of space data will profoundly transform economic and societal practices. Integrated with artificial intelligence (AI) and terrestrial networks, it will enable the development of real-time services in fields as varied as agriculture, transport, crisis management, defence and climate monitoring. This omnipresence of space in critical infrastructure will automatically increase its vulnerability, **making the resilience of space infrastructure on the ground and in orbit a key issue for collective security**.

Disruptive technologies: towards a new space paradigm

Beyond existing critical technologies and their gradual developments, several major breakthroughs are redefining the space sector and heralding a profound shift in the industrial model. Among the most transformative are:

- **Super-heavy reusable launchers,** capable of placing between 50 and 100 tonnes of payload into orbit at costs reduced tenfold, thereby overturning traditional satellite design logic — allowing satellites to become larger while still being mass-produced and competitive.
- **Hyperspectral sensors and real-time imaging capabilities,** which are transforming civil and military observation constellations into tools for instantaneous analysis of the Earth's surface.
- **Onboard artificial intelligence and autonomous processing,** enabling space systems to evolve, detect anomalies and reconfigure themselves without ground intervention.
- **"*Direct-to-device*" constellations**, ensuring seamless connectivity between terrestrial and orbital telecommunications networks and blurring the boundary between digital and space infrastructures.
- **Inter-satellite optical (laser) links,** which will revolutionise connectivity, increasing data

throughput by a factor of one hundred, or even one thousand, compared with traditional radio systems.

- **Quantum communications,** paving the way for unbreakable transmissions in critical sectors such as defence, finance and vital infrastructure.
- **Space services, including in-orbit assembly and maintenance,** introducing unprecedented modularity and scalability for space infrastructures and extending their lifespan.
- **Lastly, nuclear space propulsion and power,** offering unmatched autonomy for deep-space exploration or sustained military operations.

These advances are not isolated breakthroughs: they are part of a **global shift towards the industrialisation of space**. The traditional "handcrafted space" model is giving way to an "**integrator-driven space**" approach, based on hybrid production chains combining digital technology, energy, robotics, logistics and heavy industry — marking a true industrial revolution in the space sector. The full vertical integration of certain major players, particularly in the United States, will further disrupt global space value chains, to the detriment of European industry. Economic models are being redefined and the competitiveness of traditional players is under threat.

Structural risks and the need for regulation

The rapid increase in orbital traffic[11]**, the proliferation of launches, the increase in the volume of space debris and the saturation of radio frequencies** pose a growing risk to the stability of the space environment. In the medium term, this dynamic threatens the ability of all state and commercial players to continue their activities in safe and sustainable conditions. Without appropriate regulation, scenarios of systemic crisis or even partial collapse of the space ecosystem cannot be ruled out. Preventing this risk requires the establishment of international coordination of space traffic, which is still in its infancy.

Orbital and frequency resources: a matter of strategic sovereignty. Space resources, particularly orbits and frequencies, are subject to increasing competition for access due to the rise of mega-constellations. These critical resources are essential for global connectivity, communications security and, more broadly, digital sovereignty. Their rapid appropriation by certain players, particularly private ones, is undermining the balance of the international framework defined by the International Telecommunication Union (ITU). France must defend its interests and those of Europe, protect and promote its national frequency and orbital rights, relying in particular on Eutelsat (OneWeb today, IRIS^2 tomorrow) and on the role of the National Frequency Agency (ANFR).

By 2040, this regulation will need to become a pillar of global space governance, based on new international standards and the use of ultra-precise tracking technologies — sensors, anti-collision systems and active deorbiting solutions. The central role of the United Nations multilateral forums must be reaffirmed, both in Vienna (Committee on the Peaceful Uses of Outer Space, COPUOS) and in Geneva, in order to ensure collective, transparent and universally accepted regulation of the space domain. France and Europe must play a leading role in this process in order to ensure that our values are accepted and to avoid having the interests of other powers imposed on us; this is a matter of **normative sovereignty**.

Europe at a crossroads

For Europe, the coming decade opens a decisive strategic window. The continent, and France in

[11] UNOOSA - Working Group on Long-term Sustainability of Outer Space Activities | link

particular, face a dual challenge: on the one hand, to avoid technological, economic and military decline, particularly in relation to the United States and China; on the other hand, increasing the coherence of European space governance, which is currently threatened by the fragmentation of national and institutional approaches, at the risk of seeing any ambition for European space sovereignty disappear.

To meet this challenge, Europe must undertake an ambitious and structured review of its space policies, based on four complementary pillars: industrial sovereignty, scientific excellence, economic competitiveness and normative leadership. This revival also involves reaffirming a common vision for European space, capable of uniting Member States around a shared ambition in the future global space economy and a new sharing of intra-European technological and industrial competences.

Towards a new space ecology

The growth of the space sector must be accompanied by environmental restraint. The development of orbital activities raises a new issue: **the environmental impact of space on Earth**. In particular, the increase in launches and the **growing deorbiting of low-orbit satellites** — which partially burn up in the atmosphere — are producing effects that are still poorly understood and likely to affect the **ozone layer**.

This requires greater attention to be paid at European level to the sustainability of space activities. The space industry must also take into account the consequences of **climate change** and the **increasing scarcity of natural resources** in order to ensure the resilience of its production chains and the sustainability of its infrastructure. This imperative of environmental responsibility requires the design of a **more sober space model** that is better integrated with **ecological transition objectives.**

Conclusion: sovereignty & competitiveness or dependence

The space sector has now become one of the main indicators of technological, political and military power. Europe faces two possible paths: that of **asserted European space sovereignty,** based on an ambitious collective effort and a competitive industry; or that of **structural dependence,** subject to the standards and infrastructures of others.

The coming years will be decisive. It is less a question of imitating existing models than of building a **coherent, bold and structuring European space project** capable of expressing an original vision of the relationship between space, progress and the future.

Guiding principles to national and European space policy

The national space strategy is based on a series of principles designed to provide long-term guidance for French and European public action in the space sector, taking into account the central role of space for society, both in political and inspirational terms (human spaceflight), and in economic terms (telecommunications, navigation, data exchange, meteorology), as well as in scientific terms (Earth sciences - climate, and the Universe) and military terms (use of space as a lever of power).

1 Safeguard the core of our national sovereignty

France must guarantee, in all circumstances, the autonomy of design, production, launch and operation of critical space capabilities, at the French or European level. This involves, in particular, protecting the **standards**, **sensitive technologies**, **strategic infrastructure** and **key skills** that determine the nation's freedom of action.

2 Acknowledge the transformation of space into a domain of strategic competition

Space has become a recognised environment of confrontation. The defence space architecture must be designed to **withstand**, **protect and act**, combining **resilience**, **defensive measures and response capabilities**. The goal is to guarantee national and European **freedom of action** in space, as in other operational domains.

3 Demand a competitive and innovative industrial base

The European space industrial base must be competitive on the global market, both in terms of price and technology. The economic model must be developed at European level to this end, with the institutional side moving towards a service procurement system associated with an explicit "European preference". France must capitalise on the diversity of its industrial base, drawing on the experience of established players and the agility and risk appetite of emerging players, particularly in the New Space sector.

4 Fully harness space's inherent civil-military duality

Space is by nature dual-use: its skills, technologies and infrastructures simultaneously serve **civil, military and scientific** needs. Public action must encourage this synergy in order to **pool investments, strengthen operational responsiveness** and **accelerate technological maturity**. This civil and military duality must become a **guiding principle** for programme management, industrial organisation and funding.

5 Acknowledge the shifting balance of international relations

The country must advocate for stronger "European preference" in order to consolidate the European space market and support the European Union as the **political leader** of Europe's space efforts. It is necessary to work towards greater intra-European convergence – particularly between France, Germany and Italy – through a new distribution of space-related skills and technologies. At the same time, **extra-European partnerships should be diversified** in order to expand collaborative programmes and pool resources within a framework of controlled openness.

6 Use space as an instrument of diplomacy

Scientific excellence and technological expertise are major assets that enable France to establish itself as a leading player in major international programmes, conducted in particular with the United States, India, Japan, the United Arab Emirates and other strategic partners.

These collaborations, which are genuine instruments of influence and diplomacy, must be pursued and strengthened in order to consolidate strategic proximity with our allies, maintain the highest level of scientific and technological excellence, and stimulate the opening of new markets for our industrial ecosystem.

They also offer an opportunity to develop broader partnerships around key issues of defence, security and technological sovereignty, thereby affirming France's position as a powerhouse of innovation, cooperation and stability on the international stage.

7 Serve scientific objectives

Space technology serves the scientific community by advancing knowledge.

Beyond monitoring and understanding climate change and the impact of human activities on the planet, Earth observation plays a decisive role in strengthening our resilience to environmental, health, energy and geopolitical crises.

Space sciences deepen our understanding of our origins and of fundamental laws, while space exploration paves the way for new technological and scientific breakthroughs.

Maintaining a strong programme-driven scientific ambition in these fields is of strategic importance. It relies on the CNES's role as an agency, on strengthening France's capacity for innovation, on maximising the value of space data, and on developing strong, diversified partnerships both within Europe and internationally.

15 STRATEGIC OBJECTIVES TO SHAPE FRANCE'S SPACE POLICY TO 2040

To ensure effective implementation, the national strategy is organised around fifteen strategic objectives, which set France's priorities for action up to 2040.

It is consistent with the guidelines set out in the National Strategic Review (RNS) and the initiatives promoted by the European Union, the European Space Agency (ESA) and France's major international partners in the space sector.

This roadmap thus sets out a clear path for making France, within a sovereign Europe, a leading space power, with a sovereign and competitive industrial base, robust space defence capabilities, an innovation ecosystem open to major scientific, economic and environmental challenges, and an international cooperation architecture enabling it to participate in large-scale missions.

Implementation pathways and resources will be specified and set out in detailed in ministry-level implementation plans within six months. Their implementation will be subject to regular interministerial oversight.

PILLAR 01

ENSURE AUTONOMOUS, SUSTAINABLE AND COMPETITIVE ACCESS TO SPACE FOR FRANCE AND EUROPE

Preserving the core of space sovereignty by guaranteeing long-term, autonomous, resilient and competitive access to space for France and Europe.

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Access to space is an essential condition for the space sovereignty of France and Europe. It relies on independent, resilient and economically sustainable launch capabilities, backed by the Guiana Space Centre (CSG), a strategic national infrastructure and Europe's leading spaceport.

Ensuring its sustainability and competitiveness means continuing to operate Ariane 6, modernising the CSG and adapting its governance to the emergence of new players and new business models.

In a rapidly changing international environment, marked by the rise of reusable launchers and the transformation of the launch market, France intends to start preparing now for the next generation of space access systems. This preparation will involve mastering reuse technologies, low-cost propulsion and high-thrust engines, as well as coordinating national and European initiatives with a view to industrial convergence.

The sustainability of the European model will require a shift towards a system of multi-year institutional procurement and an explicit "European preference".

The national strategy is therefore based on two complementary priorities: consolidating the current model of sovereign access to space around Ariane 6 and the CSG (**Strategic Objective 1**), while preparing for the development of a new generation of reusable and competitive European launchers (**Strategic Objective 2**), which will guarantee Europe's strategic autonomy by 2040.

Strategic Objective 1. Guarantee Europe autonomous and competitive access to space from the Guiana Space Centre (CSG)

> *Ariane 6 will remain the cornerstone of Europe's autonomous access to space for the next decade. Its success depends on a sustainable economic model, bringing together industrial and public partners to reduce costs and invest in capacity. At the same time, the CSG must evolve into a modern, competitive European spaceport that is open to new operators.*

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Without being exclusive, autonomous access to space is an essential condition for France's and Europe's space sovereignty. It relies on a controlled, resilient and independent launch capability, structured around competitive production sites and a secure launch base: the Guiana Space Centre (CSG), located in Kourou and operated by the National Centre for Space Studies (CNES).

Since 1964, the CSG has established itself as Europe's spaceport, based on an institutional model founded on joint funding between France and the European Space Agency (ESA), and on hosting launchers developed by the ESA and operated by Arianespace and Avio. This model, which guarantees sovereign and secure access to space, must now evolve to adapt to an environment marked by the rise of New Space, increased competition and the emergence of mini-launchers.

France will honour its commitments to ensure the operation of Ariane 6, the cornerstone of Europe's autonomous access to space for the next decade. Technically adapted to market needs, particularly constellations, Ariane 6 should quickly reach full operational capacity. France is committed to prioritising the use of this launcher and will encourage its European partners to give preference to European products as a matter of course, while making manufacturers accountable for the competitiveness of the launcher.

At the same time, the CSG will need to open up to new operators. The arrival of European mini-launchers will require changes to the regulatory framework, infrastructure and pricing arrangements to ensure fair treatment and efficient use of the site.

The modernisation of the CSG is a strategic priority: it involves increasing the launch rate, removing logistical and technical bottlenecks, and adapting the infrastructure – preparation facilities, propellant production, technical networks – to the growth in space traffic. Energy resilience, environmental sustainability and coordination between stakeholders will be strengthened.

France, together with the ESA, has undertaken a review of the CSG's governance, marking the transition from a single-operator model to a more open and dynamic multi-operator model. The CNES will continue to coordinate the centre's activities, ensuring overall consistency and public control of strategic assets.

Lastly, the success of this transformation requires stronger integration with the Guiana region, through enhanced dialogue with local stakeholders and greater recognition of the economic, social and scientific benefits.

Ensuring sustainable sovereign access to space means combining two ambitions: consolidating Ariane 6 as the foundation of European autonomy and developing the CSG into a mixed European spaceport that is institutional and commercial, sustainable, competitive and rooted in its territory.

Strategic Objective 2. Prepare the development of a new generation of European launchers

> *The technological breakthrough introduced by reusable launchers and the rapid evolution of the global market require Europe to begin developing a new generation of launchers by the end of this decade in order to guarantee autonomous and competitive access to space by 2040.*

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By 2040, space access requirements will be profoundly transformed by the rise of constellations, the emergence of in-orbit services and increased demand for responsiveness for civil and defence missions. The reuse of launchers is a major technological breakthrough: it enables significant cost reductions and greater operational flexibility. Europe must therefore quickly master these technologies, as well as low-cost propulsion, in order to preserve its autonomy and competitiveness.

Given the long development cycle (seven to ten years), Europe must now begin preparing the successor to Ariane 6, for entry into service around 2035. This forward planning reflects a dual requirement: to consolidate the current model of sovereign access to space, and to work with European partners to develop a reusable launcher. The export competitiveness of this future launcher will depend on an economic model that combines institutional support with industrial innovation.

The mini-launchers supported under the France 2030 framework contribute to a more agile and innovative space access sector and help develop the technological building blocks and expertise needed for the future European heavy launcher.

The anticipated success of new reusable heavy launchers developed internationally could profoundly transform the global space-access economy, by reducing the cost of reaching orbit and redefining technological standards.

In this context, France considers that the sustainability of the European model requires moving towards m**ultiannual institutional orders and the procurement of launch services**, providing industry with visibility and stability, failing which Europe risks, in the long term, losing its autonomous and competitive capacity in the global launch market.

The national strategy for launchers is structured around three key pillars:

(1) Reusability: integrate this technology from the design stage of future launchers to promote economies of scale and preserve European competitiveness.

(2) High-thrust engines: accelerate the development of a new-generation engine, a prerequisite for a reusable heavy launcher by 2035–2040.

(3) Governance: in coordination with European partners, define the appropriate framework for developing the successors to Ariane and Vega, enabling a viable and credible economic model that ensures autonomous access to space.

This evolution also calls for moving beyond a narrow understanding of duality, once focused mainly on the propulsion sector, to adapt it to current challenges in space access and shared technologies.

PILLAR 02

BUILD A DUAL-USE, SUSTAINABLE AND COMPETITIVE FRENCH-EUROPEAN SPACE ECONOMY

Provide France and Europe with a sovereign, innovative, competitive and sustainable space economy by developing critical space technologies for 2040, structuring a diversified entrepreneurial ecosystem, maintaining excellence and training talent, and strengthening the internationalisation of the sector.

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French and European space power is based on an internationally competitive industry capable of producing critical technological capabilities. Faced with the rapid transformation of the global market and the emergence of new players, France intends to strengthen the robustness of an integrated satellite sector by bringing together established players and new entrants, and basing it on innovation, responsiveness and European cooperation. The aim is to build a resilient industrial base that is internationally competitive and adapted to future technological breakthroughs (**Strategic Objective 3**). France will also pursue a specific strategy on orbital and frequency resources, which are essential to the digital sovereignty and competitiveness of the European satellite industry.

Consideration of the space data economy is another focus of this pillar. Leveraging data from observation, connectivity and positioning should transform public policy, support innovation and benefit all economic sectors. The State will develop a national spatial data strategy, focused on simplifying access, stimulating value-added services and strengthening downstream spatial governance, in line with European initiatives (Copernicus, Galileo, IRIS^2) (**Strategic Objective 4**).

Finally, the transition of the space sector requires strengthening human capital and training for space-related professions. France will adopt a national skills strategy looking ahead to 2040, aimed at anticipating needs, structuring the regional training offering, sustaining the training initiatives launched under France 2030, and coordinating the roles of public and private stakeholders. Scientific excellence and the upskilling of research teams will remain key drivers of sovereignty, innovation and international attractiveness (**Strategic Objective 5**).

Strategic Objective 3. Restore the competitiveness of the French and European satellite industry to strengthen strategic autonomy

> *Build a competitive European space ecosystem based on shared competitiveness roadmaps that define the trajectory of future strategic technologies, in order to accelerate the maturation of critical innovations and adaptation to the commercial market, facilitate connections between research, industry and applications, and position France within a sovereign, agile and sustainable "Next Space".*

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The French satellite industry is an essential pillar of strategic autonomy. From the design of platforms and payloads to their assembly and operation, it relies on a diversified industrial base of established players and new entrants, and is supported by a dense network of subcontractors, SMEs, mid-cap companies and specialised equipment manufacturers. This coherent whole has made it possible to structure major civil, military and scientific programmes, while preserving high-level technical skills. Today, however, industrial players and space operators are facing a revolution in usage, particularly in the telecommunications market, and fierce international competition.

It is essential that the industrial sector be able to offer competitive and profitable solutions to European and global private and institutional players. Indeed, as with launchers, the institutional market must be consolidated through a strong affirmation of "European preference" and a service procurement model for Europe, but it remains too small and too fragmented to enable the sector's players to be profitable on their own. Furthermore, no European state can finance the development of tomorrow's critical capabilities on its own.

To be competitive, industrial sectors must be structured at European level, the only reasonable level for sustainable integration into international competition. If European states are prepared to commit to such an approach, this may require the construction of new industrial models (e.g. the emergence of transnational champions) and the acceptance of greater industrial interdependence. It will also mean revisiting - in competitive areas where this is justified - the concept of geographical return that underpins the ESA, which was designed with this objective of interdependence in mind but whose continued existence is now hampering the competitiveness of the European space industry. EU political leadership will be absolutely essential in this process.

To be more competitive, the space ecosystem must bring together all the driving forces of the public and private sectors, from large industrial players to emerging players. Taking note of the transformations driven by the New Space dynamic, the entire sector, both established and emerging players, must adopt a resolutely 'market-oriented' approach, including greater agility while maintaining the rigour and reliability required for space systems, working together to ensure the sector's sustainable competitiveness.

Industrial sectors must also be able to adapt over time to market disruptions and reversals, including in the field of constellations (telecommunications, Earth observation, navigation), **by cultivating the resilience of their engineering and production methods, innovation and agility.** The shift towards low Earth orbit (LEO) constellations must be pursued. For stakeholders, this will involve acquiring mass production capabilities for satellite platforms and standardised equipment and strengthening their expertise in digital and reprogrammable payloads to take account of changing standards, in line with the convergence of satellite and terrestrial networks.

The French space agency, the CNES, is a cornerstone of this ecosystem, thanks to its expertise and skills spanning the entire space spectrum. It supports the ecosystem in all its diversity (from laboratories to large groups and equipment manufacturers) and is preparing for the future in all major areas of space.

A forward-looking inventory of critical technologies in the space sector for 2040 has been drawn up, with the threefold objective of competitiveness, scientific excellence and sovereignty. It will serve as a framework for identifying the technologies to be supported as a priority, depending on whether they relate to issues of sovereignty or lend themselves to cooperation, particularly at European level.

For technologies of a strategic or sensitive nature, the State may, where appropriate, in conjunction with industry, define dedicated roadmaps to secure control, costs and associated skills. Other technologies, open to cooperation, will fuel bilateral or multilateral partnerships and the development of joint programmes.

This inventory, which will be maintained and regularly updated, will become a reference tool for national space policy: it will make it possible to anticipate disruptions, guide public and private investment where it is most useful, and strengthen the competitiveness and resilience of the European space ecosystem.

Public investment cannot be reduced to one-off investment plans: it must be considered over the long term, guaranteeing long-term visibility for institutional and industrial players, enabling a constant and confident capacity for innovation and continuous and resilient industrial development. This vision is necessary to enable the sector to remain at the cutting edge of space technology. It is a prerequisite for the credibility of our ambition.

Orbital and frequency resources are also a strategic asset for the satellite industry. France will support the defence of priority rights held, in accordance with the international framework, by French players, notably Eutelsat, and will encourage the defence of a common position at European level on this issue, in the face of major non-European players.

Strategic Objective 4. Build a downstream space economy aligned with market logic, while supporting the dissemination of space data in service of public policy

> *Make space an infrastructure that serves the public interest by promoting a sustainable space economy focused on civil uses, public policies and societal benefits, while respecting environmental and territorial imperatives.*

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Space data lies at the intersection of space, the economy and public policy: the way it is managed and exploited determines the capacity of space to fuel regional action, inform decisions and respond to major transitions. Space must be recognised not only as a driver of technological power, but also as an essential component of public policy. Space-based services — Earth observation, positioning, connectivity — already underpin many areas of action: spatial planning, environmental issues, security, mobility, and more. Yet the potential of space data remains largely underexploited, due to persistent barriers in access, processing, interoperability and utilisation. More broadly, a significant share of the European economy depends on space services, such as banking (transaction synchronisation) and agriculture. The aim is to integrate the space sector as a data-providing infrastructure, fully and natively embedded in digital solutions and services, both in terms of infrastructure and data processing (cloud computing, artificial intelligence).

A first key priority will be to strengthen the procurement of value-added services for public authorities based on space data. The State will develop simplified, interoperable and secure frameworks for access to observation, positioning and telecommunications data, for both public operators and private companies able to provide services to local authorities, public or private operators, or other business clients. The objective is to stimulate innovation and the commercialisation of value-added services in fields such as precision agriculture, forest management, natural risk prevention, urban planning and biodiversity protection. A particular effort will be made to integrate these data into the digital platforms used by public services, in line with the drive to modernise public action (open data, sovereign cloud, digital twins).

To this end, public governance of downstream space activities will be strengthened by coordinating the roles of the CNES, the National Institute of Geographic Information (IGN), Météo-France, INSEE, the Interministerial Digital Directorate (DINUM) and sectoral technical agencies, in accordance with the guidelines of the relevant ministries. Ongoing coordination with European initiatives (Copernicus, Galileo, IRIS^2, EU Data Space) will ensure complementarity of investments, control over standards and consistency in data flows. **This governance must build on the central role of the CNES as a public operator, innovation platform and ecosystem connector, facilitating the identification and expression of data and service needs.** The CNES must continue and strengthen the development of a national space data strategy by coordinating innovation support tools, promoting the uptake of space applications across regions, and establishing key partnerships with stakeholders in finance, research and public policy. This positioning as a "technological and operational platform" should enable France to build a coherent, competitive downstream sector geared towards major European and international markets.

In terms of infrastructure, this will involve assessing France's dependencies in terms of analysis and storage, particularly with regard to possible difficulties in accessing databases outside the EU. Indeed, beyond observation capabilities, data sorting, storage and analysis capabilities are now a matter of sovereignty and autonomy in their own right. France will encourage the construction of independent and secure European databases to serve Europe's strategic autonomy.

Strategic Objective 5. Nurture talent excellence and the research ecosystem in response to the technological challenges of the twenty-first century, and in close alignment with the needs of industries, research, and regions

> *Deploy a national policy of space excellence based on training and talent attraction, the scientific excellence of laboratories and research infrastructures, the development of regional centres of excellence, and the diversification of profiles - to sustain ongoing momentum and enhance human capital.*

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The development of a sovereign, sustainable and innovative space economy relies on skilled human capital capable of responding to the rapid transformations in the sector: diversification of uses, the rise of software and data technologies, the growth of New Space, automation, environmental issues, maximising the potential of laboratories. However, this skills base is at risk: a shortage of profiles in scientific, technical and digital sectors (in competition with other attractive sectors), regional imbalances in training provision, ageing in certain critical professions, a shortage of technician or assistant engineer level staff, and low female representation.

Faced with these challenges, France must adopt a coordinated, scalable and ambitious national space skills policy looking ahead to 2040, based on two requirements: meeting the growing needs of the sector and expanding opportunities for young people and the regions. Coordinated with the Ministry of National Education, Higher Education and Research, this policy will be based on four pillars.

(1) Anticipate needs by 2040. An updated mapping of shortage occupations, critical skills and future scenarios for the space sector (notably concerning systems, data, production and applications) will be developed under the supervision of the CNES, in coordination with all stakeholders. Based on the assessments carried out under the "Skills and Professions of the Future" call for expressions of interest within France 2030, it will inform guidance strategies and the redesign of the training framework from post-secondary level (Bac+2) through to doctorate, incorporating emerging professions such as: onboard AI, cybersecurity, additive manufacturing, data analysis, space environment, as well as space law, economics and geopolitics. This mapping will also address specific issues related to maintaining and developing scientific expertise, particularly in the areas of instrumentation and data processing.

(2) Deploy a structured regional offering. Building on the momentum generated by France 2030, the State will encourage the creation of regional centres of excellence in space training, backed by strategic industrial hubs (Occitanie, Ile de France, Provence-Alpes-Côte d'Azur, Nouvelle-Aquitaine, Brittany, Grand-Est, French Guiana, etc.). These centres will combine awareness-raising, initial training (bachelor's degrees, master's degrees, engineering schools), doctorates, continuing education and retraining. They will integrate the humanities and social sciences, entrepreneurship and environmental issues into their curricula.

(3) Sustain and ramp up structuring projects. The initiatives launched as part of France 2030 must be sustained over the long term. A sustainable funding trajectory will need to be defined in order to capitalise on the educational content, platforms, human resources and innovative methods deployed. The CNES scholarship programme (doctoral and postdoctoral) will need to evolve in line with needs.

(4) Better articulate the roles of the various stakeholders in the ecosystem. Enhanced coordination between the State, the CNES, research organisations, universities, *grandes écoles*, laboratories, local

authorities and professional branches will be ensured within the framework of the "space research" programme agency, through a dedicated operational group. This group will monitor needs and the training map at the national level, seeking the best complementarity between industrial and public skills with a dual focus on the efficiency of public spending and the maintenance of essential skills within the State.

This policy must fully integrate laboratories and research infrastructures in the service of excellence and innovation in the space sector. The excellence of France's laboratories permeates all space-related disciplines and enables the emergence of numerous breakthrough innovations. It also serves as a showcase for France's space capabilities, providing entry into a more open ecosystem than the industrial sector and contributing to ambitious international scientific missions, fostering a form of strategic proximity with our most advanced partners.

PILLAR 03

STRENGTHEN THE RESILIENCE AND RESPONSIVENESS OF THE MILITARY SPACE ARCHITECTURE AND ACCELERATE THE DEPLOYMENT OF CAPABILITIES IN AND TOWARDS SPACE

Guarantee the security, continuity and resilience of space infrastructure in a contested, congested and vulnerable orbital environment, by combining protection, capability autonomy, defensive action and situational awareness.

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In a context of growing dependence on space services, France has made the protection and defence of its space interests a cornerstone of its sovereignty, defence posture and national resilience, particularly since the adoption of its Space Defence Strategy (SSD) in 2019 and the creation of the Space Command within the Air and Space Force. Space systems (satellites, ground segments, user terminals and spectral links) have become essential to the proper functioning of institutions, the armed forces, businesses and civil society. They are increasingly exposed to a wide range of risks (accidental and natural) and threats (intentional), which, in the event of a major failure, could generate systemic effects.

Faced with this growing vulnerability, France must implement the national resilience strategy in the field of critical space infrastructure (Strategic Objective 6). This strategy will aim to ensure continuity through redundancy and rapid reconfiguration of essential orbital services, including in major crisis situations. This involves identifying critical infrastructure, assessing its vulnerability, mapping interdependencies, and defining scenarios for switchover, hardening and business continuity. This strategy will be implemented through a national operational plan, including an annual crisis exercise, in conjunction with the relevant European mechanisms.

This approach will be accompanied by the strengthening of military space capabilities. This involves, in particular, ensuring the autonomy of positioning, navigation and timing, intelligence, warning and communication (Strategic Objective 7) capabilities, through resilient, distributed and flexible architectures designed to support military operations that are increasingly demanding in terms of operational responsiveness. This model should enable better interoperability with command and control (C2) systems in other operational environments (air, sea, land, cyber).

The resilience of our space capabilities also depends on a greater understanding and control of the orbital environment. That is why France is committed to strengthening its space surveillance capabilities (SSA/SST) (OS8), to guarantee French and European autonomy in assessing the space situation. This requires a sovereign military network of diversified sensors, both in the metropolitan area and overseas, on the ground and in orbit, capable of detecting, attributing, characterising and anticipating space manoeuvres, including hostile ones. This capability must, as far as possible, be interoperable with allies, while diversifying partnerships in order to reduce dependence on certain suppliers of strategic data. This capability will be supported by an automated C2 system, based on AI to accelerate the operational decision loop.

Finally, France must equip itself with the means to act in and towards space, in accordance with international law and our international commitments. The objective is to have a national active defence capability (Strategic Objective 9), capable of preventing, deterring, neutralising or countering proven threats. This involves expanding the range of available courses of action: from passive hardening and manoeuvring capabilities to active intervention capabilities that can go as far as neutralisation, from the ground or in orbit. The objective is clear: to deter any hostile behaviour through the credibility of our capabilities to act, while maintaining freedom of action and controlling the risks of escalation.

Strategic Objective 6. Strengthen the resilience of critical civil and military space infrastructure

> *Establish a national plan for the continuity of critical space services, in order to guarantee the continuity of essential orbital services in the face of systemic crises, by mobilising redundancy, reconfiguration and crisis management capabilities within a structured interministerial framework.*

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Space infrastructure plays a vital role in the conduct of public policy, military operations planning, crisis response coordination, and the continuity of services essential to economic and social life. As this dependence intensifies, space-related risks and threats — whether natural, accidental or intentional — pose a systemic risk that could lead to a total interruption of service. This calls for a structured and proactive response from the State.

In this context, France must implement a national resilience strategy in the space sector. This will involve ensuring the continuity, redundancy and rapid reconfiguration of essential space services, particularly in the areas of secure telecommunications, positioning, navigation and timing (PNT), Earth observation, space surveillance and early warning. This system must be fully operational in the event of a major crisis, whether accidental (solar storm, collision, etc.) or intentional (cyberattack, jamming, etc.). This will require resilience in our sovereign capabilities, which will be further enhanced by our partnerships and commercial services.

This objective is based primarily on identifying critical infrastructure – civil, military and dual-use – and assessing its vulnerability to multifaceted threats. Interministerial work will be carried out to map cross-sector dependencies and identify points of fragility. On this basis, France will adapt its resilience plan to the nature of the identified and assessed risks in order to choose the best measures to mitigate them: redundancy of components (orbital, ground, cyber), diversification of suppliers, use of dual-use solutions, ability to operate in degraded mode, rapid response procedures in the event of failure, etc.

A national plan for the continuity of critical space services will be the central deliverable of this strategy. It will include hardening measures, switchover scenarios, enhanced security standards and pooling schemes between public and private players. This plan will be subject to an annual major crisis management exercise.

At the same time, particular attention will be paid to integrating the space dimension into national crisis management mechanisms, including inter-ministerial exercises and critical infrastructure protection mechanisms. Coordination between the relevant ministries and industrial operators will be strengthened to ensure consistency of response.

This framework must be aligned with the relevant European reference standards — notably the Network & Information Systems directive 2 (NIS2) on cybersecurity and the Critical Entities Resilience directive (CER) on the physical protection of installations — in order to make space a structuring pillar of the State's continuity of action, under all circumstances and across the entire national territory. This framework will naturally build on ongoing European programmes, particularly in the field of secure telecommunications (IRIS^2 and Govsatcom).

Strategic Objective 7. Guarantee the operational autonomy of sovereign space assets

> *Strengthen France's freedom of assessment, decision-making and action by ensuring the sovereignty of space capabilities in three critical areas: intelligence, military telecommunications and early warning.*

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As geopolitical tensions intensify and space assets become targets and levers of power, France must strengthen its ability to plan and conduct military and security operations by relying on sovereign and resilient space services. Intelligence, early warning and secure telecommunications capabilities are critical functions in this regard, not only for the armed forces' information superiority and freedom of action, but also for crisis management and national resilience.

In an environment characterised by increasing and rapidly changing threats – jamming, cyber-attacks, laser dazzling, direct ascent or orbital kinetic attacks – France's space strategy will work to consolidate its core assets through the development of distributed, resilient and responsive capabilities.

The first priority will be to improve the robustness and responsiveness of existing architectures. This requires ensuring the operational continuity of sovereign space systems for telecommunications (Syracuse) and intelligence (CSO, CERES), while maintaining their hardening, cybersecurity and ability to operate in a contested environment. They must be considered within a coherent space architecture and developed to meet operational needs as precisely as possible. This priority will be central to replacing the capabilities currently in service. Particular attention will be given to the connectivity of space C2 systems with joint command chains, in order to ensure coherence in multi-domain operations.

The second priority will be to adapt orbital and terrestrial architectures to meet new operational requirements. Future capabilities will need to incorporate greater modularity, better orbital distribution – including low and very low Earth orbits (VLEO) – and a level of performance tailored to each mission. This will require a more agile and innovative capability development process, strengthening the synergy between established industrial players and new entrants in the New Space sector. It will also involve enabling the rapid deployment, at short notice, of additional satellites via sovereign and commercial responsive launch solutions, in order to support military operations or compensate for a loss of capability. The proliferation of lightweight, reconfigurable sensors, supported by resilient constellations, will accelerate the decision-action loop, improve intelligence continuity and ensure the near-real-time connectivity essential for collaborative multi-domain combat.

The alliances, technological partnerships and commercial agreements that currently complement our operational autonomy could be put to the test due to the fragmentation of standards and increased competitive pressure. It is therefore imperative to guarantee French or European sovereignty over critical functions, while consolidating, in an appropriate manner, complementarities with our strategic partners. These are our trusted commercial players and our international partners, both at the bilateral level and at the level of the European Union or NATO, in accordance with their respective competences.

Strategic Objective 8. Strengthen French and European space-surveillance capabilities to ensure autonomous assessment and decision-making in the face of orbital threats

> *Ensure independent and reliable knowledge of the orbital situation by developing sovereign space surveillance capabilities and building on European cooperation in order to protect our satellites, anticipate hostile behaviour and preserve freedom of action.*

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In a space environment that has become a strategic theatre in its own right, the ability to understand the orbital situation determines freedom of action. Knowing what is happening there — detecting, identifying and characterising objects, anticipating adversary manoeuvres and their potential intentions — is an essential operational prerequisite for protecting our space assets, ensuring the safety of our forces, guaranteeing the continuity of critical services and preventing hostile acts. It is also an indispensable prerequisite for any defensive action in or from space. Beyond these strategic and military issues, **the exponential growth of space activities poses a risk to the sustainability of these activities, requiring the development of space surveillance capabilities for the purpose of coordinating space traffic as a whole.**

At the strategic level, France currently has a space-surveillance capability – *Space situational awareness/Space surveillance & tracking* (SSA/SST) – that relies heavily on commercial data or foreign sources. This structural dependence weakens our ability to react rapidly, exposes us to shifts in alliances and limits our autonomy in analysis and attribution. In this context, it is essential to strengthen the entire SSA chain in order to build a sovereign, precise, reliable, responsive and resilient situational-awareness capability.

For the needs of the Armed Forces, this will involve, on the one hand, densifying the national network of optical, radar and radio frequency sensors, with a balanced distribution between the metropolitan area and overseas territories to cover the most critical orbits, and on the other hand, purchasing capabilities, data and services from the specialised ecosystem, including French companies. The acquisition of sovereign capabilities deployed near the equator and polar regions is a priority issue, in line with our areas of strategic interest. At the same time, the development of spatialised SSA capabilities — orbiting sensors — will make it possible to detect smaller objects, refine anti-collision data and anticipate suspicious behaviour. Furthermore, France will be able to rely on **international cooperation, primarily within the European Union, but also with certain extra-European partners with geographical positions of interest or complementary technologies.**

At the European Union level, France will continue to support the deepening of the EU Space Surveillance and Tracking (EUSST) partnership for the benefit of civil and commercial operators, but also the armed forces, subject to adequate governance, and will therefore support the Commission's desire to significantly increase the resources dedicated to SSA in the European Union's next multiannual financial framework (MFF). As a founding member of the Partnership, France has chosen to address the challenges of coordinating space activities at European level. This choice appears relevant in order to ensure the ability of Europe and its Member States to influence international discussions on these issues, support the national ecosystem given the increasing use of service procurement, and partly finance France's sovereign capabilities for the Armed Forces.

On behalf of the Armed Forces, the CNES will continue, in collaboration with the Space Command (CDE), to develop a national catalogue of space objects based on diverse data, in order to reduce its dependence on foreign sources. In particular, it will provide an anti-collision service for national defence operations. The Space Command will supplement this catalogue so as to have the full set

of partner and/or classified data required for conducting space operations and which cannot be shared.

In parallel, the establishment of a command-and-control (C2) centre for military space operations within the CDE, with a devolved-control capability and connected to the C2 systems of the other domains (air, land, sea, cyber) and to early-warning systems, will make it possible to process, fuse, analyse and exploit space-surveillance data in real time for military purposes. This centre will need to be interoperable with the NATO Space Center (NSpC) and form part of a strengthened cooperation dynamic, via the CDE, towards the development of the Multi-Sensor Multi-Effector Network (RM2SE), in order to facilitate data exchange and joint action planning with our allies.

Strategic Objective 9. Possess a national capability for active defence in and towards space

> *Equip France with diverse and graduated modes of action, in and towards space, based on principles of intervention, deterrence and escalation control, within a joint and allied framework.*

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In a space environment marked by a rise in hybrid threats, increasing orbital congestion and the normalisation of shows of force, France must strengthen its ability to act in and towards space. This capability is intended to protect and defend national interests, prevent and deter hostile acts, ensure the continuity of strategic missions and, where necessary, act directly in and towards space, while guaranteeing strict compliance with the core principles of the international space law applicable to outer space, foremost among them the 1967 Outer Space Treaty and the United Nations Charter.

Faced with threats and adversaries capable of acting at very short notice, it is now essential to react very quickly and maintain operational resilience in all environments, including space. The acquisition of a national capacity for a graduated and diversified response — ranging from contestation or denunciation to the use of means of action — will make it possible to control all stages of escalation, while maintaining strategic freedom of action before our space interests are irreparably compromised.

This active defence capability will depend in particular on the development of detection, characterisation and attribution capabilities. These capabilities will be complemented by capabilities to disrupt, degrade or even neutralise, if necessary, an adversary's capabilities, in accordance with international law and based on a logic of gradation and proportionality. Innovative modes of action capable of producing reversible and irreversible effects, combined with reactive launch capabilities, will enable action to be taken at short notice, particularly for low and very low Earth orbits (LEO/VLEO).

Priority attention will be given to the protection and resilience of the ground segment (including C2 structures), recognised as the most vulnerable: dispersion, redundancy, physical and cyber hardening, as well as interoperable command and control, will be systematically implemented. This integrated defence posture — from the ground up to orbit — must involve the various actors of the Ministry of the Armed Forces, as well as civilian operators, within a framework of coordinated and broadened defence.

The Defence Code (CODEF) must be adapted so that the Armed Forces have the legislative and regulatory framework required to meet the specificities of military space operations for national defence purposes. This amendment must therefore take into account the protection and defence of France's space assets, the conduct of actions in space to counter malicious or aggressive acts, and the establishment of a Permanent Space Security Posture (PPS-E) integrated into a broader concept of space defence.

This overall strategy aims to guarantee France's ability to protect and defend its interests in the face of hostile acts and intentions carried out against or via space capabilities. It must enable France, where necessary, to activate graduated and diversified modes of action, in and towards space, which has become a domain in its own right within modern conflict.

PILLAR 04

DEPLOY A RESEARCH, SCIENCE AND EXPLORATION POLICY COMMENSURATE WITH THE SCIENTIFIC AND TECHNOLOGICAL CHALLENGES OF THE TWENTY-FIRST CENTURY

Make research, science and exploration the foundations of credible space power, by embracing the political dimension of space, consolidating France's scientific assets and preparing for major technological breakthroughs.

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The space sector is an indicator of power, particularly through human spaceflight, and a means of scientific analysis and understanding that must inform political decision-making. France and Europe must maintain their expertise in these areas, at a time when global warming is affecting all citizens and scientific misinformation is spreading at all levels.

In the field of human spaceflight, France will therefore pursue a pragmatic ambition based on major international cooperation (Strategic Objective 10). Human spaceflight is a lever for geopolitical power, technological innovation and collective inspiration: Europe must preserve its capacity for human presence in low Earth orbit (LEO), within the framework of international programmes.

It will also strengthen its contribution to Earth sciences from space, in the service of ecological transition and resilience (Strategic Objective 11). The observation of the Earth system is now a major lever for knowledge, anticipation and public action. Faced with accelerating global change, France intends to maintain its scientific, technological and industrial expertise in the fields of altimetry, atmospheric sounding, gravimetry and digital twins. Maintaining this expertise will be based on a roadmap incorporating upstream research as well as downstream innovation, mission development and the data infrastructure (Data Terra) necessary for transfer and complementarity with the downstream economy.

France will pursue an ambitious scientific policy in the space sciences (Strategic Objective 12), by consolidating its leading role in major research missions conducted within the ESA or in cooperation with other international partners. This ambition will be supported by an ecosystem structured around the "laboratories–industry–CNES" triptych, by centres of excellence in instrument development, and by scientific priorities collectively defined through the CNES scientific foresight seminar. It will guide France's contributions to major forthcoming programmes while preparing the technologies, data and talent required for their success.

Strategic Objective 10. Promote French and European ambition in space exploration and human spaceflight, in conjunction with major international programmes

Promote a French and European ambition for space exploration, based on secure access to low Earth orbit, a strong scientific contribution to robotic Mars exploration, and a gradual participation in lunar programmes.

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Space exploration, particularly human spaceflight, has traditionally been a strategic indicator of power and long-term projection. It combines major political, scientific, technological, industrial and societal dimensions, while embodying a powerful collective imagination. France, a pioneer in Europe in manned flight thanks to its cooperation with the USSR in the 1970s and the flight of the first cosmonaut from a European Union country in 1982, has always defended a cooperative approach grounded in shared goals and the public interest. In a context marked by Sino-American competition, uncertainty over the direction of US programmes, the rise of private actors and the growing influence of space powers such as India, France must now renew its ambition and set out its concrete pathways.

Europe's exploration policy has three simultaneous objectives via the ESA – low Earth orbit, the Moon and Mars – through substantial contributions to American programmes. France supports a long-term, pragmatic and graduated strategy, structured around three complementary pillars:

(1) Maintaining opportunities for French astronauts to fly in low Earth orbit (LEO). Human spaceflight primarily responds to political and geostrategic challenges. Beyond its exploratory value, it is a powerful lever for attractiveness, scientific training and inspiration, as demonstrated by the enthusiasm for the latest selection of European astronauts. Low Earth orbit is the foundation of a long-term ambition. France will continue to support the ISS programme in cooperation with the United States and will contribute, in particular, to the development of the reusable European space cargo vehicle. France will explore new partnerships with established and emerging space powers in order to send astronauts into space. In addition to the opportunity for European astronaut flights, France will consider the use of robotic capabilities to meet its scientific needs.

(2) Consider a European presence on the Moon through a progressive approach based on international cooperation. Regardless of the uncertainties surrounding the ARTEMIS programme, France will examine opportunities for cooperation on scientific missions of opportunity (characterisation of the Moon's internal structure, study of Sun–planet system dynamics, mineralogical mapping, etc.). It will also explore possible robotic contributions, particularly in the fields of surface transport, energy and crew physiology, following an incremental approach that supports future prospects for human missions to Mars. In the event of a long-term human mission, France will study the conditions for participating in a potential international programme.

(3) Strengthen France's contribution to robotic exploration of Mars. Mars is a strategic scientific priority. France will investigate the continuation of Martian robotic programmes in light of developments in the American position. It will study the development of new robotic missions within the ESA or through bilateral cooperation.

Strategic Objective 11. Strengthen France's investment in Earth sciences from space, in support of the climate, the environment and resilience

> *Make Earth sciences a strategic pillar of knowledge, scientific excellence and sovereignty by structuring ambitious action on Earth system cycles, technological breakthroughs, climate services and European governance.*

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Earth sciences from space make it possible to characterise the major cycles of the Earth system (water, carbon, energy), observe environmental dynamics at all scales and understand the functioning of the Earth's internal structure. Beyond the goals of advancing knowledge and achieving scientific excellence in this field, it also responds to growing operational, geopolitical and societal needs: climate, biodiversity, resources, security, crisis management and sovereignty.

France today holds a leading position in Earth sciences, supported by internationally recognised scientific excellence and centres of excellence in altimetry, radiometry, optical observation and atmospheric sounding. It benefits from acknowledged scientific and research expertise, proven industrial know-how, the ability to lead ambitious missions or provide major payloads (such as SWOT), and a strategic role in major European (Copernicus, Earth Explorer) and multilateral programmes. France must preserve and strengthen its leading position within scientific programmes, notably by catching up with or anticipating technological breakthroughs (lidar, gravimetry, hyperspectral imaging). In this context, it has identified three priorities:

(1) Deepen understanding of the Earth system and its critical balances, by prioritising progress on the water, carbon and energy cycles, the protection of the oceans, air–land–sea interactions, biodiversity and coastal dynamics, climate tipping points and feedback mechanisms. The continuity of long-term observation records is essential for deciphering current changes. This requires preserving France's centres of excellence and developing new, ambitious missions featuring technological breakthroughs, which may be supported by the CNES balloon programme and by constellations operated by private actors.

(2) Strengthen the impact of Earth sciences on public policy and services to society by integrating observation data into regulations, climate assessments, risk management, territorial adaptation and decision-making platforms. The rise of digital twins, early warning systems and embedded AI will bring observation closer to real time. **Achieving this objective will require increased support for French research infrastructures, in particular Data Terra through its data and service hubs. At the European level, existing national capabilities will need to be networked.**

(3) Prepare for technological breakthroughs and new instrumental sectors through sustained investment in R&D and demonstrators: quantum gravimetry, atmospheric lidar, innovative altimetry, miniaturisation, multi-sensor systems, formation flying, embedded AI, and experimentation with light sovereign constellations (GES, hyperspectral imaging).

The CNES will play a leading role in this strategy: coordination of national projects, technological support, integration of New Space innovations, steering of scientific strategy via the "space research" programme agency, and coordination between scientific programmes and downstream needs, particularly those of public authorities. The industrial, academic and technological fabric will need to be supported to ensure the continuity of critical sectors, data infrastructures (Data Terra), processing platforms and in situ capabilities essential for the calibration and validation of satellite measurements.

Strategic Objective 12. Pursue an ambitious scientific policy in the field of space sciences

> *Consolidate French excellence in space sciences by successfully completing major ongoing missions, preparing today for future major international cooperation, and strengthening technological autonomy, under the leadership of the CNES.*

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France is one of the world's leading nations in the field of space science and can claim particular scientific excellence in this area. This position is the result of a proven model based on close cooperation between research laboratories, the CNES and industry, which has made it possible to combine scientific ambition, technological innovation and major contributions to major international missions. This strategy has given France a central place in the ESA's mandatory scientific programme, while ensuring its leading participation in missions conducted with NASA, JAXA and other partners.

Space science missions play a structuring role for the entire sector: beyond their contribution to advancing knowledge, they sustain rare skills within laboratories and industry, stimulate innovation in instrumentation, train high-level researchers and engineers, and enhance France's international standing. They are also a source of inspiration, national cohesion and public confidence in science.

By 2040, France's priorities in space sciences will be organised around six key areas, defined through the scientific foresight exercise carried out by the CNES and the space-research community in 2024:

(1) The frontiers of physics, including the search for violations of the equivalence principle, the physics of the primordial Universe and the understanding of matter at the mesoscopic scale.

(2) The formation and evolution of structures in the Universe, from the cycle of hot baryons in X-rays to that of cold baryons in the far-infrared, to improve understanding of the formation of stars, galaxies and protostellar discs.

(3) The origin of the Solar System and exoplanetary systems, particularly the ice giant planets, compared with the most common types of exoplanets.

(4) Habitability and the origins of life, through the exploration of Mars, the icy moons and the search for biosignatures on temperate exoplanets.

(5) Sun-planet interactions, and the understanding of radiative environments through multi-point in-situ measurements.

(6) Life sciences in orbit, centred on maintaining astronaut health and performance in extreme environments.

Two priorities will be phased over time. The first is to complete the missions currently under development and to organise an ambitious scientific exploitation of them, in particular by strengthening capacities for processing complex data. **The second is to anticipate the major missions of the following decade** (L4 Enceladus, HWO, Uranus Orbiter and Probe, L5, M8, etc.) by structuring, from today, a forward-looking preparation programme. This requires a sustained effort in R&D, demonstrators, preliminary projects, doctoral and postdoctoral training, as well as support for instrumental fields of excellence (spectrometry, chromatography, seismometry, magnetometry) and future sectors (high-contrast instrumentation for exoplanets, in situ sample analysis, miniaturised plasma cameras, etc.).

As the agency responsible for space research programmes, the CNES will coordinate national

activities, oversee the technology development of the most complex payloads and, in some cases, be responsible for ground segments for data analysis and exploitation, working closely with the scientific community. The development of these critical skills will require increased human resources and the full mobilisation of internal expertise.

Active participation in ESA's mandatory scientific programme remains the foundation of this strategy, which must be complemented by structural bilateral cooperation (United States, Japan, India, etc.) and national initiatives. With regard to bilateral programmes, France will continue its policy of participating in ambitious space science missions by providing one or more highly specialised instruments (such as SEIS and the ChemCam and SuperCam instruments on Perseverance and Curiosity, for example).

Given the increased uncertainty surrounding the future direction of major partners, France will need to anticipate the risks of excessive dependence on certain critical technologies by exploring European or national alternatives in sensitive areas.

PILLAR 05

CONSOLIDATED AND DIVERSIFIED INTERNATIONAL COOPERATION, PROMOTING RESPONSIBLE USE OF OUTER SPACE AND BENEFITING THE ENTIRE FRENCH SPACE COMMUNITY

Promote an international strategy aimed at ensuring a safe, secure, stable and sustainable space. In line with our strategic, economic, security and defence interests, this will result in the strengthening and diversification of our bilateral cooperation and strong support for the rise of the European framework in the service of the resilience, diversity and competitiveness of the French and European industrial ecosystem.

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The rapid transformation of the global space environment — marked by the arrival of new players, major technological and industrial disruptions, rising geopolitical tensions and the emergence of risks of all kinds — is upsetting the balance of established cooperation and increasing strategic competition. In this context, international regulation of outer space, the preservation of a resilient space ecosystem and the strengthening of cooperation are essential levers for serving our national and European strategic interests.

France must revisit its partnerships, particularly in Europe, in light of global economic competition and the dual nature of space activities, with the long-term goal of ensuring the sovereignty and competitiveness of the European space sector in order to avoid marginalisation in the face of the American-Chinese duopoly.

Pursue active regulatory diplomacy by playing a leading role in the development of international standards for the sovereign and responsible use of outer space (Strategic Objective 13), at a time when economic competition and power dynamics are tending to profoundly unbalance the uses and benefits of space. In particular, it will take decisive diplomatic action within the International Telecommunication Union (ITU) to defend a fair international framework and preserve European orbital and frequency rights in the face of growing competition for access to these resources.

France also wishes to preserve Europe's space sovereignty, which requires the European Union to increase its influence in space-related matters (Strategic Objective 14). This means clarifying the division of roles between the EU and the ESA, by establishing the principle that strategic management is the responsibility of the former and technical and programmatic execution is the responsibility of the latter. France considers this to be a necessary condition for establishing a competitive European space sector that excels in technology and expertise. This effort will be accompanied by sustained dialogue with our major European partners, starting with Germany and Italy, in order to promote political, technological and industrial convergence, which is key to maintaining European space sovereignty and Europe's place in the world of space by 2040. France will strengthen its dialogue with the United Kingdom, a space power and key partner, particularly in the field of space telecommunications, given its involvement in Eutelsat.

At **the same time, France will continue to be open to opportunities for cooperation with space powers outside Europe (Strategic Objective 15)**, with a view to diversification and burden sharing. The space sector could thus become one of the strategic pillars of our bilateral relations. In a highly competitive international market, where public support plays a central role, France will step up its diplomatic support for exports in the sector, including for the benefit of emerging New Space players.

Strategic Objective 13. Pursue active regulatory diplomacy by playing a leading role in the development of international standards for the sovereign and responsible use of outer space

> *Play a leading role in developing international standards that guarantee the responsible, safe, secure, stable and sustainable use of space, promoting balanced regulation based on international law, reciprocity and the preservation of its strategic freedom of action.*

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France will continue to play a leading role in multilateral forums in the development and consolidation of a regulatory environment that guarantees the responsible, safe, secure, stable and sustainable use of space. Faced with the diversification of uses, ambiguous or even hostile behaviour, the risks of uncontrolled escalation and the development of potentially destabilising technologies, it will defend a rules-based international order, which is a prerequisite for the safety, stability and sustainability of space activities.

French diplomatic action will be based above all on the permanence of the founding principles of international space law, first and foremost among which are the 1967 Outer Space Treaty and the United Nations Charter. It will reaffirm their full enforceability, promote their universal application and denounce any attempt to circumvent, exploit or weaken them. France will strongly condemn any violation or behaviour that threatens compliance with these principles, starting with the risk or threat of placing weapons of mass destruction in space, which is highly destabilising for international security.

It will continue its efforts in the relevant multilateral forums, namely:

- **In Geneva,** within the framework of the PAROS programme, it will continue to promote the development of standards and principles of responsible behaviour aimed at preventing an arms race in space and strengthening space safety.
- **In Vienna**, within the CUPEEA, it will actively support the implementation and enhancement of guidelines on the long-term sustainability of space activities.
- **Within the International Telecommunication Union (ITU)** and the Conference on Disarmament, it will remain vigilant in the face of attempts by strategic competitors to circumvent or exert destabilising influence. More specifically within this forum, France will ensure equitable access to orbital and frequency resources within the established multilateral framework.

True to its commitment to setting an example, France will encourage the implementation of transparency and confidence-building measures (publication of national strategies, notification, information-sharing) and will call out the lack of transparency shown by actors who refuse to apply them. It will also remain vigilant regarding the non-proliferation of space technologies that could contribute to the development of ballistic missiles, particularly by certain proliferating states.

France will advocate a realistic and balanced approach to the regulation of space behaviour and activities. It will oppose any attempt to impose unverifiable, excessively restrictive or asymmetrical standards that could unilaterally limit the growth of its space defence and resilience capabilities. It will support a gradual approach based on dialogue, transparency and reciprocity.

Finally, it will pay particular attention to the long-term sustainability of space activities: frequency management, orbit sustainability, regulation of in-orbit services, and coordination of space surveillance systems (SSA). In particular, within the framework of the CUPEEA, it will support efforts to better articulate and coordinate regional SSA systems in order to ensure the safety of space

operations.

To carry out this work, France will draw on the full breadth of its industrial, scientific, institutional and academic expertise, and will ensure the consistency of its positions between Vienna and Geneva, while strengthening complementarity between the European Union and NATO.

Strategic Objective 14. Foster European leadership on space issues, politically steered by the EU, technically supported by ESA, and drawing on the renewed dynamism of the Franco-German and Franco-Italian relationships.

Promote the European Union as a political leader in space by clarifying governance, strengthening strategic investments and taking security issues into account, and renewing Franco-German and Franco-Italian partnerships in order to preserve European industrial interests and assert Europe as an autonomous space power.

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The Draghi report highlights the risk of Europe falling behind due to fragmented initiatives, the complexity of European governance and insufficient collective investment. These factors weaken Europe's position on the international stage, exposing its Member States to growing dependence on competing powers and constituting a vulnerability that will only intensify as the coming decade, up to 2035–2040, is expected to bring major new technological and industrial disruptions that risk marginalising Europe. This situation threatens European strategic autonomy and the sustainability of the French space industry. It calls for a response that is commensurate with the challenges. Above all, it must be European: politically transparent, ambitious in terms of budget and focused on defining common strategic orientations.

For the past twenty years, European space governance has been based on a complementary relationship between the European Union, which pilots major programmes (Galileo, Copernicus, IRIS²), and the ESA, the technical agency responsible for development and implementation, which has historically built Europe's space sector. While this arrangement has made it possible to pool skills and budgets, it now suffers from several limitations: competing initiatives, fragmented management and a lack of a common strategic vision. France is calling for stronger political leadership from the Union: the EU (Commission and Council) must set the priorities, while the ESA should refocus on its valuable role as a technical agency. This clarification will need to be enshrined in the future EU-ESA framework agreement, alongside better coordination with space operations (EUSPA).

France will take advantage of the alignment of European timetables from 2025 onwards to defend the three pillars of a European space programme that is politically clear, ambitious in terms of budget and capable of setting its strategic priorities:

- **Firstly, within the next multiannual financial framework (2028–2034), a decisive step towards making space a major industrial and strategic lever.** France will support the objective of significantly increasing the European space budget, subject to clear earmarking for strategic industrial priorities: competitiveness, technological sovereignty, support for European champions, and anchoring the principle of "European preference". It will continue its diplomatic efforts to convince the Union of this ambition and promote a regulatory framework conducive to investment. It will campaign for the extension of the Versailles agenda to the space sectors to help structure a long-term European industrial policy;
- **Next, during negotiations on the draft European regulation on the security, resilience and sustainability of space activities within the EU (Space Act), which is intended to provide Europe with a new regulatory framework.** France will strive to ensure consistency with its national legislation (Space Operations Act), to support a competitive Europe, and to promote its ambitious standards internationally;
- **Finally, within the framework of the upcoming ESA Ministerial Council Meetings (CMIN), which**

set the Agency's main programme and budgetary guidelines, France will continue to defend its strategic objectives and national and European interests, in close coordination with its partners.

At the same time, France will prioritise European cooperation based on concrete projects, accepting a form of mutual dependence among Europeans.

To fuel this European ambition, France will revitalise its historic bilateral partnerships with Germany and Italy, in order to promote a new European industrial and technological convergence, which is key to European space sovereignty.

Partnerships with other European countries will also be developed. Enhanced formats for dialogue will be created or revitalised.

Strategic Objective 15. Open up new prospects for international cooperation

> *Deepen or launch cooperation with extra-European and emerging space powers, within the framework of international programmes offering alternatives of interest to our space strategy, while rallying support for our multilateral space diplomacy, a global issue.*

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As the balance of power in space is rapidly shifting, France, already considered a major player in international cooperation in the space sector, will strengthen and diversify its bilateral and multilateral partnerships beyond Europe and the ESA in order to structure cooperation networks in line with its strategic, security and industrial interests and to give substance to realistic capability ambitions for Europe and France.

France will maintain close bilateral relations with the United States, particularly within the framework of the existing space dialogue. In the short term, it will encourage the pursuit of the most ambitious cooperation initiatives, in coordination with its European partners, the EU and the ESA.

Beyond the European circle, France will deepen its space dialogues with its major space partners, Japan and India. Space will be a major pillar of bilateral relations and will integrate scientific, security and defence, industrial and regulatory issues as part of a coordinated approach. Large-scale space programmes will be pursued and considered on a bilateral basis.

France will also continue its strategic partnerships with emerging space powers. These players, with growing ambitions but still little involvement in international regulatory dynamics, will become medium-term strategic partners in the field of space. France will propose scientific and technological cooperation, based on a policy of reasoned openness, supervised transfer and promotion of European excellence.

These partnerships will be consolidated or built with a strong economic foundation, incorporating export support, scientific diplomacy and dialogue with industry. The full breadth of the French offering will be supported, taking into account the emergence of new actors (start-ups, SMEs and mid-caps) and protecting critical know-how. Strengthened dialogue between the State and industry must help streamline export-control procedures and, where necessary, adapt support instruments. The continuation of the export and New Space seminar organised by the MEAE, the structuring of coordinated support via the system for monitoring major export contracts, and the promotion of cooperation and expertise within the CNES and the French Development Agency (AFD) group, which contributes to the implementation of France's policy on development and international solidarity, will be the levers of this policy.

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51, boulevard de La Tour-Maubourg - 75007 Paris
N 48°51'23,5" E 2°18'43,2'"
www.sgdsn.gouv.fr