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IN BRIEF

Evaluating China's Space Capabilities and Ambitions

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China's space ambitions now outpace every other country – even the US. From the establishment of the People's Republic of China in 1949, the Chinese Communist Party has always seen space as key to cementing China's status as a global superpower. These ambitions have outlived the Cold War era space race, with China's State Council publishing five high-level policy papers on space between 2000 and 2021. Yet China's space ambitions are about far more than building international status. Space capabilities are seen by China's leadership as critical to economic security and military superiority, particularly as it seeks to control the strategic technologies of the future.

The strategic importance of space in Beijing's vision is clear. Ye Peijian, Chief Commander and Chief Designer of the Chinese Lunar Exploration Programme, has been explicit about China's determination to secure its place in space, stating: "If we don't go now when we can, future generations will blame us. If others go first, they will take control, and we won't be able to go even if we wanted to." This reflects a fundamental belief that those who establish an early foothold in space will dominate its vast resources – crucial not just for future exploration but also for ensuring China's long-term economic security on Earth. This is perhaps why Bill Nelson, the head of NASA, declared last year that the US and China had entered a new "space race" in their ambitions to return to the moon. China's space ambitions are also closely linked to its goals to establish a world-class military on par with the US. The increasing dual-use nature of space technology makes distinguishing between military and civilian functions challenging. Space is part of a fragile network of vital infrastructure. The countless military and civilian activities that depend on satellite connectivity are a major vulnerability in future conflicts between advanced military powers.

More broadly, China's leadership sees space competition as just one component of a broader international competition for dominance in science and technology. Deep space is listed as one of nine priority sectors within China's 14th Five Year Plan, which aims to spur development of technologies seen as of national strategic importance. China wants its own companies to offer alternatives to dependence on the US for technologies such as GPS, while taking a lead in new technologies such as space resource extraction. China has already taken on a prominent role in global communications infrastructure through national champions such as Huawei, and will want to see these companies retain their lead as communications technology integrates more closely with space infrastructure.

Beijing's space development to date

Beijing aims to establish itself as a leading space power by 2045. Its roadmap includes six key milestones, among them landing astronauts on the Moon by 2030 and developing a nuclear-powered space shuttle by 2040. Its short-term ambitions include the launch of a solar power satellite, three quantum communication satellites into low Earth orbit and a mission to sample the near-Earth asteroid Kamoʻoalewa. China has demonstrated a strong track record of meeting its milestones, reinforcing its credibility as a space superpower. In 2022, China successfully placed three astronauts aboard the Tiangong 'Heavenly Palace' space station, the country's first permanent space station. By 2024, China advanced its reusable space technology by launching the Shijian-19 satellite with a Long March-2D rocket, part of its efforts to rival SpaceX in the reusable launch sector, and deployed the initial batch of ten satellites for its Guowang mega constellation.

China views space not only as an area for scientific and technological progress but also as an essential

component of national security and defence. The conflict in Ukraine has served as a stark reminder of the military value of space assets, with satellites proving crucial for communications, surveillance, and targeting. Beijing is undoubtedly applying these lessons to Taiwan, ensuring that its space-based capabilities can play a decisive role in any potential conflict scenario.

Last year, the Chang'e-6 mission successfully landed on the Moon before relaunching with the first-ever samples collected from its far side. It is the latest demonstration of China's expanding capabilities in space exploration. China has laid out plans for further robotic and crewed missions, aiming to establish a sustainable presence on the lunar surface by the 2030s. In partnership with Russia, China is also working on the International Lunar Research Station, a project intended to rival the US-led Artemis coalition.

The military dimension of China's space programme

China's People's Liberation Army (PLA) is undergoing a major transformation with the goal of becoming a 'world-class' military force by 2049, with interim milestones to be 'war-ready' by 2027 and have a 'modernised military' by 2035. It now possesses the world's largest naval fleet and a vast nuclear arsenal, with 600 operational warheads. In addition to these conventional forces, China is undergoing a major digital modernisation programme, due for completion by 2027. This initiative covers space operations, counter-space capabilities, electronic warfare, and autonomous drone fleets.

Building space capabilities is a key part of this long-term plan, cutting across a number of domains critical to modern warfare. Firstly, space infrastructure is seen as the "central pillar" to joint operations between different PLA branches. Compared to the US, China is lacking in recent combat experience, especially in conducting operations between different units – seen by PLA military planners as key to success in modern conflicts. Space-enabled communications are seen as part of the solution to this problem, enabling greater coordination between different units. Secondly, space capabilities are important for intelligence, reconnaissance and surveillance operations. Using satellites or near space vehicles to conduct reconnaissance missions can provide a safer and more effective alternative to conventional ground- or air-based methods. Thirdly, space capabilities are critical for long range precision strikes, which rely on satellites to detect, track and provide targeting data. China has been strengthening its precision strike capabilities, with the Dong Feng series providing a range of anti-ship ballistic missiles and intermediate-range and intercontinental ballistic missiles. These capabilities are key to a conflict with the US over Taiwan, with denying, delaying or deterring US forces from entering the region being a primary objective.

The role of commercial enterprises

Unlike the US, where private space companies operate with significant independence, China's commercial space sector is deeply intertwined with the state. While the number and capabilities of its private firms are growing rapidly, they remain largely state-backed, with government contracts serving as their primary source of funding. A clear example of China's technological progress is the BeiDou Navigation Satellite System, developed as a rival to the US Global Positioning System (GPS). BeiDou's satellite constellation is nearly double that of GPS, with 56 satellites in orbit. Its global network of monitoring stations is also more extensive, enhancing Positioning, Navigation, and Timing (PNT) data availability. This provides greater accuracy than GPS in certain regions, particularly in developing countries. Moreover, BeiDou's two-way messaging capability–a feature absent from GPS–offers significant advantages in both civilian and military applications, reinforcing its role in surveillance, reconnaissance, and secure communications. The BeiDou satellite navigation system, along with the Guowang and Qianfen constellations, is part of a broader strategy to secure technological and strategic autonomy from foreign networks such as Starlink.

Despite rapid progress, China still lags behind the US in certain aspects of space development. While China's private space sector is smaller and remains closely linked to the PLA, the US boasts a diverse and competitive industry. Established giants like Boeing operate alongside newer, tech-driven disruptors such as SpaceX and Blue Origin, as well as a growing number of agile startups. China's state-led model brings certain advantages, including streamlined decision-making and fewer political obstacles compared to the often slow-moving bureaucracy of democracies. However, it also faces significant drawbacks, particularly a lack of transparency and barriers to fostering entrepreneurial innovation. Meanwhile, the US approach has its own trade-offs. While setbacks such as Boeing's ongoing struggles with the Starliner project have highlighted the risks of a more decentralised system, occasional failures ultimately contribute to a more dynamic and resilient industry. The commercialisation of spaceflight in the US,

where private companies now routinely launch astronauts using commercially operated vehicles, represents a major leap forward – one that China has yet to replicate.

Risks to Europe's competitiveness and security

As space technologies play an increasingly important role in critical infrastructure and military capabilities, European countries will have to weigh up the risks of integrating Chinese space technologies into these systems. Allowing Chinese technologies to process sensitive data presents a major espionage and surveillance risk. This is particularly true for communication technologies, a fear that has already led many European countries to reject Huawei's 5G telecommunication infrastructure. Integration also brings a risk of sabotage or intentional disruption. While the prospects of all-out conflict with China may seem remote, China's growing use of 'grey-zone' coercion tactics poses a threat to Europe. China's deepening military cooperation with Russia is of particular concern, with China seeking to work with Russia to project power into the Arctic and undermine NATO. Chinese ships are already suspected of sabotaging undersea cable infrastructure in the Baltic Sea, which is likely a testing ground for further grey-zone operations against Taiwan.

Bolstering European competitiveness in space capabilities is a key part of mitigating these risks. The most undesirable outcome for Europe would be dependence or lock-in to Chinese-made space technologies. While China's current commercial space products might have limited market share in Europe, this cannot be expected to continue indefinitely. China is actively working to expand space partnerships in the Global South, establishing minilateral space initiatives such as the BRICS (Brazil, Russia, India, China and South Africa) Remote Sensing Satellite Constellation and the Asia-Pacific Space Cooperation Organisation (APSCO), which brings together member nations including Bangladesh, Iran, Mongolia, Pakistan, Peru, Thailand and Turkey. Such partnerships could drive global demand for Chinese technologies, allowing them to grow rapidly.

Case studies such as the solar PV industry show how quickly Chinese companies can disrupt and eventually dominate key industries. China is able to leverage significant state resources into supporting its national champions, outcompeting international rivals and monopolising production. If Chinese companies are allowed to dominate key space technologies, this creates new dangers of dependency and lock-in that Europe will struggle to break out of. The expansion of China SatNet – a state-backed enterprise developing the Guowang satellite megaconstellation – together with the continued growth of major aerospace players like CASC (China Aerospace Science and Technology Corporation) and CASIC (China Aerospace Science and Industry Corporation), as well as emerging commercial players such as GalaxySpace and i-Space, underscore the substantial progress China is making in advancing its space capabilities.

Developing home-grown space technologies is also important to avoid reliance on an increasingly unreliable US. The US will always be a necessary and preferred partner for Europe in space technologies, especially given its industry dominance and certainly when compared to China. However, the broader uncertainties around ongoing US support for European security interests have to be mitigated against too. Concerns over whether Ukraine will be able to continue using Elon Musk's Starlink communications infrastructure illustrate these risks. Aside from the strategic advantages, investing in space technologies can provide a major source of industry, jobs and growth opportunities for European companies. The space industry has historically led technological advances in a range of fields - advantages that Europe would do well to exploit.

Driving innovation across Europe's space sector

Europe's difficult economic conditions make advocating for space investment a challenge, with access to government funding subject to intense competition. However, space should be a strategic priority and an essential pillar of European security. Increased funding will send a demand signal that the space sector will respond to. European Commissioner for Defence and Space Andrius Kubilius has sent encouraging signals with his proposed Defence Industrial Strategy and the upcoming 'Readiness 2030' white paper focused on boosting investment and competitiveness. His call for a European Space Shield, which includes plans to engage member states and space commands in shaping a shared approach to space domain awareness is also welcome.

For Europe to maintain a strategic edge, it must take a more coordinated approach to developing its space capabilities, ensuring that commercial entities operate in an environment that fosters innovation. This should include improving procurement processes so that tenders are less time-consuming and expensive for firms to undertake. This will encourage more SMEs to participate, who are often the most innovative. European governments should also increase their risk appetite in procuring from newer companies rather than just the established

primes, and offer a greater number of grants to SMEs. Policymakers have the tools to create a more competitive landscape, especially as the space sector remains heavily reliant on government contracts. The EU has developed a reputation for prioritising regulation over fostering cutting-edge innovation–a perception reinforced by its approach to AI governance. Without creating an environment that attracts investment and nurtures technological breakthroughs, the innovation gap with China and the US will only widen.

Europe should take a strategic approach to its space policy, focusing on targeted investments and close collaboration with key partners. Maintaining strong ties with the US is important, as is building further cooperation with other emerging space nations such as Canada, South Korea and Japan to help maximise the impact of resources available. Specialising in areas of comparative advantage would also offer better value for money, as would standardising components across the continent. Europe should prioritise innovation in areas where it can achieve maximum impact rather than attempting to match the scale of other space powers. One such area where Europe maintains a competitive advantage is Earth observation (EO) and navigation technologies. A significant portion of space's value lies in the data and predictive analytics derived from satellite imagery, benefiting both civil and defence sectors. Numerous European commercial providers already supply or leverage EO data downstream. Copernicus – the largest EO programme in the world – and Galileo, a satellite navigation system known for its superior accuracy compared to the American GPS, are relied upon by nations around the globe.

Europe should be pragmatic in developing EO capabilities that complement those of partner organisations - particularly world-leading commercial providers in the US. For instance, aligning on varying resolution levels or differentiating between multispectral and hyperspectral imaging can help Europe play to its strengths. Europe should focus on domains where it holds a genuine competitive edge, while maintaining access to the highest-quality capabilities available. Although increasing self-sufficiency is important, it should not come at the expense of performance or data access. Europe should procure from a wide range of providers to limit risks to accessing data. Better using this vast pool of data is essential.

However, public sector bodies have been slow to harness the full potential of new technologies like AI and machine learning to maximise the use of this available data. Embracing these technologies would not only reduce costs and improve efficiency but also allow analysts to extract deeper insights and utilise data in more impactful ways. By automating data collection and interpretation, analysts could shift their focus to higher-value activities, such as assessing the broader implications of data insights rather than spending time processing raw information. Embracing these technologies will drive growth in the EO sector and to downstream providers who utilise their data. Achieving this transformation will also require investment in upskilling, ensuring public servants have the technical expertise needed to operate at a higher level in the data value chain, along with a cultural change in some public sector organisations that are less willing to embrace new technologies and ways of working. It is essential that Europe better leverages space data to ensure its commercial entities are successful and globally competitive.

European space leadership on the international stage

Slowing down the space race is essential to reducing existential threats, from nuclear escalation to the risks posed by miscalculated policy decisions. The Cold War demonstrated how quickly secrecy and paranoia can bring the world to the brink, but it also showed that cooperation is possible between rivals. Space governance is one area where collaboration is needed. The current regulatory framework is outdated and inadequate for managing the growing risks in orbit. The uncontrolled re-entry of China's Long March 5B rocket booster in 2022 and Russia's deliberate destruction of the Cosmos 1408 satellite highlight the pressing need for reform. All major space powers claim to support the goal of improving governance. The US reaffirmed its commitment to "strengthening the global governance of outer space activities" in its 2023 space diplomacy framework. China has expressed a willingness to engage in discussions on space environment governance, and Russia has stated that solving global challenges is one of its space policy goals.

However, each nation interprets space governance differently. Broad terms such as "peaceful purposes" allow states to present themselves as responsible actors without necessarily adhering to responsible behaviour. The US-led Artemis Accords sought to establish clearer rules but is unlikely to gain support from Beijing or Moscow. Europe should take the lead in shaping a more inclusive and effective regulatory framework. Reforming the Outer Space Treaty, which was established in 1967 – long before the rise of commercial space enterprises – should be a priority. More coherent space rules would also provide crucial guardrails for protecting space resources such as those on the Moon, which the World Monuments

Fund has already listed as an endangered heritage site. Currently, no nation can enforce laws on celestial bodies that remain unclaimed. As private companies continue to expand their activities in space, there is a growing risk of a modern-day Wild West emerging, not least as the line between commercial and state continues to be blurred. Without clear regulations, competition for resources could lead to disputes, environmental damage and increasing militarisation. The European Commission's proposed EU Space Act, expected in 2025, signals a strong commitment to taking leadership in this domain. It may take a major incident to focus minds on the need for safeguards. So far, incidents have led to limited consequences for those responsible.

As the competition for global space leadership heats up, Europe risks falling asleep at the wheel. China's rapid development of space capabilities are shifting the global balance of power, allowing it to come closer to military and technological parity with the US. Such a world is fraught with danger for Europe, particularly if it becomes locked into dependence on Chinese space technologies for critical infrastructure. At the same time, increased uncertainty over the strength of the trans-Atlantic relationship means that Europe cannot rely entirely on the US either. It is incumbent upon European leaders to invest in Europe's ability to compete as a viable actor in the space arena, while also leading efforts to strengthen global space governance. European companies already have a promising lead in some key technologies. However, it should not take these for granted. Only by investing in space can Europe preserve its security and competitiveness for decades to come.

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