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The role of space power in geopolitical competition

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Executive summary

- Increasingly, space power is being linked to counter space capabilities, sensitive security considerations and national interest calculations.
- Governments are reasserting their primacy in space affairs on strategic grounds. The liberal internationalist perspective on space as a sanctuary and common heritage of humanity is starting to give way to a new kind of ‘astro-geopolitics’, particularly in the calculations of revisionist powers.
- Space is vital for prosperity in the contemporary era and has become a centre of gravity. Without space, modern society would simply stop working. There is also a strategic technology convergence underway between space applications and the wider ‘Big Data’-driven digital economy.
- North Atlantic Treaty Organisation (NATO)-type militaries would find it extremely difficult to conduct major combat operations without access to space, with up to 90% of the equipment of some allies such as the United Kingdom (UK) reliant on space to some degree.¹
- Space power is now an integral element of national power, and therefore should be seen as an increasingly distinct factor in calculations of global balances.
- The application of space power in geopolitics takes three forms:
 - Indirect or soft, to include leveraging space capabilities for diplomatic goals, as well as space diplomacy itself;
 - Direct, non-military uses of space for strategic geopolitical influence;

¹ Chris Deverell, Speech: ‘General Sir Chris Deverell KCB MBE ADC Gen, Commander of Joint Forces Command’, Ministry of Defence (United Kingdom), 08/11/2017, <https://www.gov.uk/> (checked: 19/01/2024).



- To change the military balance, particularly in the land and maritime domains.
- In the global space power balance, the United States (US) remains, for now, the undisputed leader. But the People's Republic of China's (PRC) space programme is increasingly advanced and US intelligence expects that by 2030 it will erode American influence across military, economic and diplomatic spheres. Russia is narrowing its focus on offensive counter space capabilities, while Indian space power is growing at pace.
- Countries in Europe appear not to have real ambitions to become global space powers, with their space investments being primarily subject to the logic of economic return and narrow national interests.
- There is no such thing as 'European' space power. While the European Union (EU) displays collective excellence in civil and scientific space activities (primarily through the European Space Agency (ESA)), it remains incapable of cohering its approach to pan-continental *security and defence* space issues.
- The EU's move towards real space power status would need to include three major transformations:
 - A conceptual shift away from the logic of 'return on investment' when considering funding for space capability development, towards one that understands the *strategic* value of space power;
 - Reducing protectionist barriers and opening European space programmes to non-European competition, which would attract the foreign investment and technology needed to boost the entire European space enterprise;
 - New institutional mechanisms for jointly-owned projects, with flexible authorities allowing faster and more efficient delivery and fundraising. Suggestions include a European Space Investment Corporation, a European Cis-Lunar



Organisation and a Space Venture Capital Arm for ESA.

- Inevitably, policymakers and strategists will be confronted ever more frequently with space power issues, so it is advisable that they take an interest in some of the basic aspects of this field.
- Recommendations for space collaboration on issues of shared strategic interest among countries supportive of an open international order include:
 - A ‘coalition of the willing’ on space sustainability, to leverage market access regulations, in a coordinated manner, in order to shape norms of behaviour among large private sector space operators;
 - Two potential initiatives to support stability in the global strategic space competition: a Transparency Initiative, centred on joint Space Domain Awareness capabilities (especially space-based assets); and a Space Deterrence Initiative, potentially under the aegis of NATO, and connecting with Indo-Pacific partners as well;
 - An ESA-like Intercontinental Space Alliance drawing in Indo-Pacific partners such as Japan or India, with support and co-leadership from key European space nations.



1.0 Introduction

With outer space recognised as a ‘province of all mankind’,² civilian space affairs traditionally have had a different status than other strategic domains, often rising above the politics of the day. Space has provided an ideal context for international cooperation, sometimes even in (or because of) times of intense ideological confrontation such as the Cold War. But a new period of ‘astro-geopolitics’ is now emerging, where governments are increasingly concerned with sovereignty.

Moreover, space power is being linked specifically to *offensive* counter space capabilities. A good example is the Indian anti-satellite test in 2019; when he announced the test, Narendra Modi, the Prime Minister of India, declared that India had become a ‘space superpower’. Semantic purists might take issue with the use of ‘superpower’, but more important is the implication that offensive military capability indicates a nation’s space power.

The new space economy has likewise expanded extremely fast over the past decade, tapping into a mix of commercial opportunity and plummeting barriers to entry. One consequence of this new ‘gold rush’ is that growth has not kept pace with understanding the political risk dynamics at play in the commercial space environment.

In the late post-Cold War period, relative geopolitical stability coupled with maturing space technologies created the ideal conditions for private investment to drive space market growth unencumbered by significant political constraints. But the shift in geopolitics back towards geopolitical rivalry means that the global space environment – in terms of both the commercial sector and government programmes – increasingly is subject to sensitive security considerations and calculations of national interest.

A new stage of global space development is emerging, where the private sector continues to be the source of most innovation in the space economy but where governments are reasserting their primacy in space affairs on strategic grounds – even when acting commercially like the UK investing in OneWeb.

² ‘Article I’, Outer Space Treaty, 1967, <https://www.unoosa.org/> (checked: 19/01/2024).



The link between geopolitics and space is ever tighter. New military ‘space commands’ and increasing government spending indicate that space power is being formally accepted and integrated as an element of national power across all major countries. Understanding space power dynamics and the new ‘astro-geopolitics’ will be increasingly important to risk mitigation and successful execution of space strategies in support of both economic and security goals in the coming years and decades.

1.1 Structure

To explain the role of space in geopolitical competition, this Report first offers a perspective on the *strategic* role and importance of space in the civil and military spheres of human activity. It then proceeds to a discussion of *space power* and the different ways in which it can be applied in pursuit of national interests. This is followed by an overview of the key national space programmes, including those of the US, PRC, Russia, and others, to provide a broad outline of the global balance of space power. Particular attention is then devoted to the European space programme, along with suggestions for its reform. Finally, the Report concludes with three principal recommendations pertaining to joint space action.



2.0 Space technology and modern society

In recent decades, the global space sector has undergone significant levels of commercialisation. Prior to this, significant outer space activities belonged almost exclusively to the leading powers, being dependent on the public finance provided by state agencies and (outside of the Soviet Union) conducted in partnership with a select few private companies. However, governments have increasingly shifted themselves to become the customers of space services and products, sturdy customer bases have solidified, and small and medium space enterprises have surfaced. This new, increasingly commercialised dynamic in the sector is often referred to as 'NewSpace'. It is embodied by the expansion of downstream services using data derived from satellites, the emergence of launch companies³ and private small satellite constellations,⁴ space tourism,⁵ and more recently a wave of venture capital finance⁶ and SPAC mergers.⁷ In 2021, private investment in space companies reached a new annual record of US\$10.3 billion with SPAC deals comprising a significant proportion.⁸

NewSpace is enabled by, and coincides with, drastic reductions in the cost of launch, the downscaling of satellites (small satellites), and the flourishing space applications sector. In turn, this has reduced the barriers of entry for private companies as well as allowing for an influx in new state actors. Within the space of just five years alone, from 2017 to 2021, over ten nations established a national space agency.⁹ Ultimately, NewSpace has facilitated the expansion of downstream space services, opened new consumer markets, and enabled an

³ Such companies include: SpaceX, Rocket Lab, Blue Origin, Skyrora, Virgin Galactic and Virgin Orbit, Orbex, Rocket Factory. Also, see: NewSpace Index, 'Small Satellite Launchers', No date <https://www.newspace.im/> (checked: 19/01/2024).

⁴ For example: OneWeb, Starlink, Planet, BlackSky, Kleos Space. Also, see: NewSpace Index, *NewSpace Constellations*, No date, <https://www.newspace.im/> (checked: 19/01/2024).

⁵ 'Factbox: Branson, Bezos and Musk – three space tourism pioneers', *Reuters*, 09/07/2021, <https://www.reuters.com/> (checked: 19/01/2024).

⁶ Joshua Oliver, 'Space: the new frontier for investment trusts', *Financial Times*, 08/07/2021, <https://www.ft.com/> (checked: 19/01/2024).

⁷ 'The Rise of SPACs', *Satellite Applications Catapult*, 16/04/2021, <https://sa.catapult.org.uk/> (checked: 19/01/2024).

⁸ Using the app provided, navigate to Q3 of 2021 in: 'Space IQ: Space Investment Quarterly Report', *Space Capital*, No date, <https://www.spacecapital.com/> (checked: 19/01/2024).

⁹ Marco Aliberti *et al.*, 'Emerging Spacefaring Nations', *European Space Policy Institute*, 06/2021, <https://www.espi.or.at/> (checked: 19/01/2024).



increasingly sustainable space economy. Following these trends, the global space economy, now standing at around half a trillion dollars¹⁰ is projected to reach US\$1 trillion by 2030.¹¹

2.1 Civil and commercial

Space is a vital infrastructure for national prosperity. Without space, modern society would simply stop working. Space-enabled services underpin large chunks of the economy today. The financial sector, for example, is enabled by precise time-stamping of financial transactions, with global time data distributed by Global Navigation Satellite Systems (GNSS) such as the American Global Positioning System (GPS). This also means that without that timing signal ATMs would malfunction and the banking system would freeze up.

In the area of transport, things are similar: space supports all its major modes, from aviation to maritime navigation, not to mention upcoming ‘smart mobility’ solutions which depend on precise positioning data and other space services. Telecoms use precise timing for bandwidth management; satellite backhaul for data transfer; and now, satellite broadband and soon phone to satellite (‘direct-to-device’) connectivity. In short, mobile communications worldwide depend on space.

The list goes on, for example with Net Zero and things like Environmental and Social Governance (ESG) or associated new markets like spatial finance: the policies and regulatory systems shaping these areas are all based on evidential data about climate change. None of this vision and the activism around it can happen without climate monitoring from space (the vast majority of environmental measurements require Earth Observation satellites).

The macro trend underlying the escalating use of all these different space applications is the ever deeper intertwining of the Internet/digital economy with space-derived ‘Big Data’, to the point where they depend on each other. This is an important **convergence in**

¹⁰ ‘Press Release: Space Foundation Releases the Space Report 2023 Q2’, Space Foundation, 25/05/2023, <https://www.spacefoundation.org/> (checked: 19/01/2024).

¹¹ See: ‘A giant leap for the space industry’, McKinsey and Co, 19/01/2023, <https://www.mckinsey.com/> (checked: 19/01/2024); and, ‘The New Space Era: Expansion of the Space Economy’, Bank of America Institute, 26/01/2023, <https://institute.bankofamerica.com/> (checked: 19/01/2024).



strategic technology, which only makes space power more relevant in the 21st century.

The implications of such developments are profound. Space capacity writ large – the systems, capabilities, space industrial base available to a given state – is now morphing into a centre of gravity.

2.2 *Military*

Spaceflight is a military invention and the entire history of this domain, until very recently, has been overwhelmingly dominated by strategic considerations. The first rockets to fly into space were the German V2 ballistic missiles directed at British targets starting from 1944, while the onset of the ‘Space Race’ during the Cold War was likewise overseen by the defence establishments of the major powers.

Therefore, contrary to mistaken language sometimes employed in contemporary discourse, the ‘militarisation’ of the space domain is not a new phenomenon but its genesis. The real issue is the long-standing concern over the *weaponisation* of space, i.e., the placing of various types of weapons in orbit. The question is complicated by the fact that there is no clear definition of ‘space weapon’ or even ‘spacecraft’ in international law. Space weaponisation is thus a matter of policy and legal interpretation – as it can contravene some of the provisions of the Outer Space Treaty, most directly those related to weapons of mass destruction – and it remains the subject of debate in both academic and government circles.

It is, of course, in the *practical* development and employment of military power where the role of space systems is most directly felt. The First Gulf War of 1991 is often considered the ‘first space war’ because of the large-scale use by Coalition forces of satellites for military communications and ISTAR (Intelligence, Surveillance, Target Acquisition and Reconnaissance), enabling precision strikes and the highly effective use of force.¹² This was a watershed moment for adversaries, particularly the PRC which from that point onwards embarked on a decades-long pursuit of what it now terms ‘intelligentised warfare’, with cyber and space enablers at its core.¹³

¹² David Vergun, ‘Space Domain Critical to Combat Operations Since Desert Storm’, Department of Defence (United States), 19/03/2021, <https://www.defense.gov/> (checked: 19/01/2024).

¹³ See: Koichiro Takagi, ‘New tech, new concepts: China’s plans for AI and cognitive warfare’, *War on the Rocks*, 13/04/2022, <https://warontherocks.com/> (checked: 19/01/2024).



The dependency of the armed forces of leading free and open countries on space cannot be overestimated. In 2017, Gen. Sir Chris Deverrell, then Commander of UK Joint Forces Command (now Strategic Command), stated publicly that ‘90% of the platforms and systems that constitute the UK military equipment programme are dependent on space to some degree.’¹⁴ NATO-type militaries would find it extremely difficult to conduct major combat operations without access to space-based capabilities; they would be rendered deaf, blind and disoriented, with almost everything that gives them the ‘technological edge’ over their presumptive adversaries being lost at a stroke.

Some of their most advanced, high precision, GPS-guided missiles would not work. Strategic and operational command and control would collapse because over-the-horizon communications – particularly vital in naval or long-range manned or unmanned air operations – would likewise be critically degraded and made reliant solely on ground-based and airborne networks. Satcom loss means that the capability of the most cutting edge kit, such as the F-35 ‘Lightning’ Joint Combat Aircraft, would be severely impaired. But perhaps the most dramatic consequence from the loss of space support would be that the vast majority of the American, British and European *intelligence* and battlefield awareness capability would simply evaporate, with incalculable knock-on effects on combat effectiveness in the field.

¹⁴ Chris Deverrell, Speech: ‘General Sir Chris Deverrell KCB MBE ADC Gen, Commander of Joint Forces Command’, Ministry of Defence (United Kingdom), 08/11/2017, <https://www.gov.uk/> (checked: 19/01/2024).



3.0 Applying space power

With its growing impact on advanced countries, space is coming fully into its own as an instrument of national strategy and a source of ‘strategic advantage’ in systemic competition.¹⁵ In other words, ‘space power’ is now an element of national power, and therefore should be seen as an increasingly distinct factor in calculations of global balances of forces for geostrategic purposes. Policymakers and strategists inevitably will be confronted with ever more frequency with space power issues in the years ahead, so it is advisable that they take an interest in some of the basic aspects of this field.

While space power theory is lagging behind practice, it is useful to note at least the key operative definition of the term, which was outlined by John Sheldon and Colin S. Gray, academics in strategic theory, positioning space power as ‘the ability in peace, crisis or war to exert prompt and sustained influence in and from space’.¹⁶ This definition is short, practical and agnostic with respect to the entities exercising space power, allowing for the consideration of both states and non-state actors.

An important trend in the understanding of space power, which has emerged in a particularly strong way since the advent of NewSpace, has been the emphasis on the non-military component. With commercial actors becoming more important and access to space being democratised at rapid pace, there has been a vast growth in the application of space solutions to a wide range of problems – for example, in support of overseas development assistance programmes – and customer or market requirements.¹⁷

These evolutions have widened the scope and applicability of space power but have also introduced new conceptual fault lines. One of these is the **decoupling of civilian and military space activity** as the private sector has grown in importance particularly in the free world.

¹⁵ For more on ‘strategic advantage’, see: Gabriel Elefteriu, William Freer and James Rogers, ‘What is strategic advantage?’, Council on Geostrategy, 23/11/2023, <https://www.geostrategy.org.uk/> (checked: 19/01/2024).

¹⁶ Colin Gray and John Sheldon, ‘Space Power and the Revolution in Military Affairs: A Glass Half Full?’, *Airpower Journal*, Autumn 1999, p. 36.

¹⁷ See, for example: Farooq Sabri et al., ‘UK Space Agency, Space for Policy in Developing Countries’, UK Space Agency, 08/2020, <https://www.spacefordevelopment.org/> (checked: 19/01/2024).



SpaceX stands as the quintessential example of this dynamic, particularly through the unique role played by Starlink in Ukraine. However, this approach is not shared by countries such as the PRC and Russia, which still view civil and military space power as unified in theory and practice.

As described above, space is able to make an increasingly substantial contribution to the overall national power of major actors in the international system. It brings economic, scientific and military benefits and, when pursued in conjunction with effective space policies, space capabilities can accelerate the strategic advantage of the countries in question. But this is a way of viewing space as an *integral* part, an ingredient, of aggregate national power. The question of applying space power per se, as a distinct instrument in geopolitical competition, is a different issue.

In broad terms, the application of space power in geopolitics takes three key forms. The first can be understood as an **indirect, soft** and often *speculative* use or exploitation of space-related activities or issues for the purpose of influencing events and advancing political agendas in a general sense. The second relates to the **direct, strategic** and largely *non-military* leveraging of space technology in achieving specific goals, usually as part of a wider strategy. And the third main application of space power relates to its increasing ability to impact the global **military balance**.

3.1 *Soft uses of space power*

Soft uses of space power include the public release of satellite imagery before Russia's renewed offensive against Ukraine, which can be counted as a form of space diplomacy. Another is the *free* provision of GPS signals to the entire world by the US.

Space has also grown in prominence through its important contributions to Net Zero, considering that the great majority of scientific measurements required to track the actual progression of climate change can only be made from space. Satellite data is therefore essential for verifying countries' environmental commitments and identifying carbon emissions and the carbon footprint of various commercial enterprises and activities.

To all this must be added the more classic soft power outlook of civil space activities that we saw arising during the first Space Age, with



countries using space achievements to increase their international prestige.

With the expansion of the economic and scientific scope of space activities, states are also now able to leverage their space capabilities for diplomatic goals, with *space cooperation* now becoming an increasingly valuable asset or aim to be offered or pursued in international relations. And in general, space issues have risen on the international agenda at the highest levels, with G7 or G20 meetings now starting to include space-related items.¹⁸

Finally, there is the important and ever-growing field of *space diplomacy* itself, which largely relates to the myriad of regulatory and legal questions related to the evolving international space regime being negotiated at various levels within the United Nations (UN) system. For a long time this has been somewhat of a ‘backwater’ of international diplomacy but the combination of a growth of the global space economy together with the aggravation of safety concerns in regards to the space operational environment – due to debris and the increase in satellite numbers – has brought new urgency to space diplomacy.

3.2 *Strategic, non-military uses of space power*

Space power, in terms of a nation’s mastery of space technology, and the space infrastructure which it can deploy, is something that can be *leveraged* for prosperity at home or indeed for influence abroad: that is, for national power.

A prominent example of this behaviour is provided by the PRC. In 2016, the Chinese launched the **Space Silk Road** concept, also known as the ‘Belt and Road Initiative [BRI] Space Information Corridor’. It is about the PRC offering BRI countries access to its satellite data, offering partnerships in building satellites, as well as offering support with developing space value chains for these nations, from space ground infrastructure through to applications. By signing up to the ‘Space Information Corridor’, states participating in the BRI would therefore become dependent on Chinese-provided space services such as BeiDou, the Chinese GNSS and budding alternative to the American GPS.

¹⁸ See, for example, paragraph 35 of: ‘Carbis Bay G7 Summit Communiqué’, The White House, 13/06/2021, <https://www.whitehouse.gov/> (checked: 19/01/2024); and, ‘G7 Hiroshima Leaders’ Communiqué’, The White House, 20/05/2023, <https://www.whitehouse.gov/> (checked: 19/01/2024).



The PRC's Space Silk Road is notable for its complex integrated strategic vision. The physical infrastructure located in orbit – the satellites – is just the 'hardware' which in turn enables a whole space applications and data ecosystem that, in time, become central to economic performance and public services in a given country. Similarly to the way the PRC has used Huawei, this is designed to lock target countries into a technological dependency – a clear case of using space power to advance geopolitical goals.

3.3 Space power and the military balance

Important as satellite services are to modern society and wider government activities, space capabilities are particularly critical to modern military operations. These require support from across the three main functions that can be performed by orbiting satellites: **communications**, for battlefield and beyond the horizon connectivity; intelligence, surveillance and reconnaissance (ISR), for targeting; and **navigation**, including positioning (via GNSS), for precision strike.

All this has been on full display during Russia's renewed offensive against Ukraine where there is also tremendous involvement from commercial space companies. In terms of **communications** or connectivity, the Ukrainians, for example, use the Starlink satellite broadband service to share targeting data quickly, for artillery fire. **Space-based ISR** has also become vital – alongside drones – in supporting military operations by identifying and locating enemy units – and generally making the battlefield much more transparent than it has ever been. Even *commercial* optical sensors can 'see' objects as small as an iPad, from space. SAR (synthetic aperture radar) technology, which works through clouds and at night, now offers resolutions of around 25 centimetres. Then there are satellites with radiofrequency geolocation capabilities, which can detect radio and mobile phone usage, electronic warfare (jamming) and radar emissions; and commercial infrared or 'thermal' space-based sensors. These are usually used for detecting forest fires but have been repurposed to detect artillery fire, explosions and other types of events and targets on the battlefield. Finally, GNSS, such as **GPS or GLONASS**, have been essential for precision strike by both sides, through the use of precision guided munitions.



Such space capabilities combine to support Ukraine's 'deep fight': the ability to destroy targets deep in the Russian rear, with long range precision fires, assisted by a fusion of data all from these different sensors in space as well as on aerial drones. This is what gave Ukraine the edge over Russian artillery, at least during the summer of 2023. Thus, space has a practical effect on the battlefield where it can negate key traditional advantages in the classic domains and weapons categories. Add space to the equation, and the military balance shifts.

Space power is also altering the balance in **maritime environments** as command of space is becoming the foundation for the command of the sea, with satellites enabling both critical ISR missions across great swathes of the ocean and, crucially, long-range strike – particularly with missiles, including hypersonics. The ability to defend against the missile threat is essential to contemporary naval operations. This missile defence mission requires the capacity to detect the launch immediately, acquire the target, track it, and quickly send the data to the interceptor(s).

Space systems are vital for this cycle: advanced missile defence missions, particularly as technology evolves, become impossible without space support. This is why the US Department of Defence is building the Proliferated Warfighter Space Architecture, a multi-orbit constellation that includes different layers of satellites with different functions.¹⁹

¹⁹ See: 'SDA Layered Network of Military Satellites Now Known as "Proliferated Warfighter Space Architecture"', Space Development Agency (United States), 23/01/2023, <https://www.sda.mil/> (checked: 19/01/2024).



4.0 The global balance of space power

A country's ability to wield space power for geopolitical advantage – whether directly, as in the case of the PRC's Space Silk Road, or indirectly through altering the military balance – depends on the global configuration of the *space balance*. Whether acknowledged or not, the world's principal space actors are engaged in a strategic competition both for perfecting their capabilities in certain types of space activities – whether launch, space exploration or even Position, Navigation and Timing (PNT) – and for denying or cancelling the advantages that their adversaries are developing, with Russia's focus on counter space systems being a case in point. It is therefore important to consider, in broad terms, the space posture of the key space powers.

4.1 The American programme

The US is indisputably the world's leading space power in terms of investment, industrial base, science and technology, innovation ecosystem and operational capabilities. In 2023, the combined *baseline* US civil-military space budget was more than US\$50 billion, with US\$25.3 billion for the National Aeronautics and Space Administration (NASA)²⁰ and \$26.3 billion for the US Space Force (USSF).²¹ But when accounting for other lines of space spending, including through the National Reconnaissance Office which runs the most advanced American spy satellites, the *total* US spending in this domain amounted to some US\$73 billion in 2023 – a full 63% of all government space budgets in the world.²²

In particular, the establishment of the USSF in December 2019 is a landmark moment in the history of space affairs. It served as a recognition of the fact that the space domain had reached full strategic maturity, both in operational terms and in its fundamental importance to national strategy.

²⁰ 'NASA's FY 2023 Budget', The Planetary Society, No date, <https://www.planetary.org/> (checked: 19/01/2024).

²¹ Sandra Erwin, 'Congress adds \$1.7 billion for US Space Force in 2023 spending bill', *Space News*, 24/12/2022, <https://spacenews.com/> (checked: 19/01/2024).

²² 'New historic high for government space spending mostly driven by defence expenditures', *Euroconsult*, 19/12/2023, <https://www.euroconsult-ec.com/> (checked: 19/01/2024).



US national security space capabilities comprise satellites operated both by intelligence organisations like the NRO (roughly 60–70 spacecraft) and by the military itself, mostly through the USSF which is responsible for at least 114 spacecraft across its main defence space constellations, by one estimation.²³ To these are to be added a variety of other satellites, including experimental and demonstrator spacecraft, weather satellites operated jointly with the National Oceanic and Atmospheric Administration (NOAA), as well as the satellites being deployed under a previously-separate project overseen by the Space Development Agency.²⁴

Table 1: Key US military space constellations

Designation	Full name	Type	Satellites
GPS	Global Positioning System	PNT	37
DMSP	Defense Meteorological Satellite Program	Weather	3
Milstar	Military Strategic and Tactical Relay	Satcom	5
AEHF	Advanced Extremely High Frequency System	Satcom	6
DSCS	Defense Satellite Communications System	Satcom	7
WGS	Wideband Global SATCOM	Satcom	10
FLTSATCOM	Fleet Satellite Communications System	Satcom	6
UFO	Ultra-High Frequency Follow-On	Satcom	10
MUOS	Mobile User Objective System	Satcom	5
SBIRS	Space-Based Infra-Red System	Early Warning	10
DSP	Defence Support Program	Early Warning	5
GSSAP	Geosynchronous Space Situational Awareness Program	SSA	6
SBSS	Space-Based Space Surveillance System	SSA	1
STSS	Space Tracking and Surveillance System series	SSA	3

Over and above these US Government-owned national security satellites, America's strategic advantage in the space domain increasingly is supported and extended by dual-use capabilities fielded

²³ See: 'US Space Force', 2023 Index of US Military Strength by the Heritage Foundation, 18/10/2022, <https://www.heritage.org/> (checked: 19/01/2024).

²⁴ See: 'Who we are', Space Development Agency, No date, <https://www.sda.mil/> (checked: 19/01/2024).



by its world-leading commercial sector – particularly in the communications (e.g., Starlink, ViaSat, and so on) and remote sensing areas (Maxar, Capella, etc.). The strong growth in the US private space market is effectively adding hundreds and thousands of satellites to the military-relevant capabilities that the US Department of Defence can mobilise for national security purposes in a crisis.

4.2 The Chinese programme

Although some way behind the US, the PRC's space power is on a strong growth trajectory and constitutes one of the top strategic priorities of the Chinese Communist Party (CCP). Xi Jinping, the General Secretary of the CCP, has articulated a clear vision for the PRC's 'Space Dream', which is a major plank of his 'Rejuvenation' grand strategy.²⁵ As part of this endeavour, it is an official State objective to win for the PRC the status of the world's leading space power by 2045.²⁶ Space exploration occupies an extraordinarily important place in Chinese culture, with strong popular support for space activities and, in particular, with a strong sense of the PRC as a space *nation*.²⁷

The most important recent assessment of Chinese space ambitions is to be found in a US National Intelligence Estimate declassified by the Office of the Director of National Intelligence in September 2022.²⁸ This 2021 document noted that the PRC's 'national space strategy focusing on becoming a global leader in space almost certainly will remain a top priority through 2030', with the PRC leadership 'politically committed to achieving this vision to match or exceed current space leaders' capabilities as part of Beijing's broader drive for global leadership.'²⁹ The assessment further noted that 'by 2030 Chinese space activities will increasingly erode the national

²⁵ 'Backgrounder: Xi Jinping's vision for China's space development', *Xinhua*, 24/04/2017, <http://www.xinhuanet.com/> (checked: 19/01/2024).

²⁶ Kevin Pollpeter, Timothy Ditter, Anthony Miller and Brian Waidelich, 'China's Space Narrative', China Aerospace Studies Institute, 01/10/2020, <https://www.airuniversity.af.edu/> (checked: 19/01/2024).

²⁷ Chloe Taylor, 'Kids now dream of being professional YouTubers rather than astronauts, study finds', *CNBC*, 19/07/2019, <https://www.cnbc.com/> (checked: 19/01/2024).

²⁸ NIEs are some of the US Intelligence Community's most authoritative analytical products, being prepared for top-level decision-makers including the president. See: 'Chinese Space Activities Will Increasingly Challenge US Interests Through 2030', Office of the Director of National Intelligence (United States), 04/2021, <https://www.dni.gov/> (checked: 19/01/2024).

²⁹ *Ibid.*



security, commercial and *global influence* advantages that the United States has accrued from its leadership in space'.³⁰

The Chinese space programme is therefore deliberate and strategic, traditionally achieving on time almost all the milestones set out in the country's consecutive planning documents. As in other domains, the PRC's civil and military space activities are intertwined. Further, Chinese strategy is autonomous, ensuring an end-to-end development of the country's space capabilities starting with an expansive ground-based infrastructure.

It is in the technological arena where the Chinese space programme has delivered the most impressive results, despite the vast development gap it had to make up for with respect to the United States. In most space-tech verticals the Chinese now seem to be only a few years behind the Americans, and in some niche areas such as space-based quantum communications, they appear to be ahead.

In launch, recent weeks have seen evidence of successful Chinese testing of SpaceX-type reusable rockets, while the Long March 9 is envisaged as a reusable super-heavy lift rocket similar to Starship. In satellite communications, however, the PRC is behind in the mega-constellation competition, but it has its own plans in this regard with the **GuoWang** and **G60 projects** and their deployment appears to be only a matter of time.³¹

PNT has been a particular priority for the Chinese space programme and it has yielded important results. The country's GNSS, BeiDou, is now in its second iteration and the new generation of BeiDou satellites constantly adds new services and capabilities, including text messaging.

Earth Observation capabilities have similarly received strong emphasis and investment, initially driven by Beijing's recognition of the huge value of Earth Observation applications for development and general civil purposes across the country's vast geography. However, in recent years the PRC has started to pivot increasingly more towards strengthening the *military* side of its capabilities in this class of satellites, with almost half of the Earth Observation launches in 2022 representing defence ISR spacecraft.

³⁰ *Ibid.*

³¹ Andrew Jones, 'First satellite for Chinese G60 megaconstellation rolls off assembly line', *SpaceNews*, 29/12/2023, <https://spacenews.com/> (checked: 19/01/2024).



Other highlights of Chinese space policy include its exploration programme, with the PRC currently operating the only *national* space station in orbit, as well as the strong focus on space-based solar power technology. Of greatest concern and geopolitical interest, however, are the PRC's growing counter space capabilities which are also driving improvements in other critical dual-use technologies such as Rendezvous and Proximity Operations (RPOs).

4.3 The Russian programme

The Russian space programme is widely seen as a declining and increasingly ineffectual enterprise. These trends have accelerated since the full-scale invasion of Ukraine in 2022, which triggered the expulsion of Soyuz from the Western launch market, thereby cutting off a large source of revenue for Roscosmos.

The distinguishing aspect of the Russian 'cosmostrategy' is the complete subordination of space activities to the country's military priorities and requirements.³² Space capabilities are seen as important components of Russia's overall military power, firstly through the technological crossovers with the Strategic Rocket Forces, and secondly, through their offensive potential.

Russia's experience in waging war against Ukraine is likely to have a major impact on its future space policy. One lesson that the Kremlin may draw is that high-intensity modern warfare in the 21st century *can* be waged successfully in conditions of space inferiority, as is the case for Russia. The country's space capabilities are clearly inferior in every battlefield-relevant area – from space-based ISR to satcom or PNT – compared to what free and open countries have been able to mobilise in support of Ukraine even just via commercial providers like Maxar or Starlink, let alone classified data from military assets that might be shared with Kyiv.

It is therefore possible that the Ukrainian campaign is validating Russia's longstanding preference for prioritising *offensive* counter space capabilities while minimising its own reliance – certainly in the military sphere – on space. In recent years, Russia has tested effective anti-satellite weapons (the Nudol missile system) as well as new types of RPO satellites designed to physically interfere with adversary spacecraft in orbit.

³² Anne Maurin, 'Russia's Offensive Cosmostrategy', *Aether*, 2:1 (Spring 2023).



Overall, Russia may come to perceive that its space power *asymmetry* with respect to NATO members, chiefly the US, is in fact a strategic advantage in its favour. This can have highly destabilising consequences in the years ahead, which can only be expected to be mitigated by political considerations with respect to its Chinese partner's own space interests.

4.4 The Indian programme

Indian space power has come to increasing global prominence in recent years, both in the military sphere – with the 2017 anti-satellite test – and, particularly, in the civil domain. The Chandrayaan-3 historic landing at the lunar south pole in August 2023 – a world first – was a dramatic demonstration of Indian prowess in space exploration and technology. This, as well as the overall development of India's space power, is a result of sustained, deliberate government and indeed societal focus on space activities over many years. In these respects, as well as in the level of national ambition and strategic prioritisation of the space domain, India's approach is similar to that of the PRC – and driven by a similar reading of the increasing intertwining of space and geopolitics.

In line with its geopolitical status, India has developed end-to-end space capabilities across almost all areas of space activity, from launchers to sovereign PNT systems and robotic space exploration, with autonomous human spaceflight set to be achieved by 2025. Again like the PRC, India's space programme places an important emphasis on the use of space services in support of regional development and the management of the country's huge subcontinental landmass. This accounts for the fact that of the roughly 50 government-owned Indian satellites (with eight of them being military spacecraft), over half are dedicated to remote-sensing missions.³³

³³ Data from: Union of Concerned Scientists, UCS Satellite Database, 01/05/2023, <https://www.ucsusa.org/> (checked: 19/01/2024).



4.5 Middle Eastern programmes

A compelling example of the acceleration in global space affairs is to be found in the Middle East, where Saudi Arabia and the United Arab Emirates, in particular, are now taking a deep interest in this sector. Both countries have established new space agencies, recruited new specialist staff – including internationally – and have developed far-reaching, ambitious national space strategies with projected funding on the order of US\$2–3 billion over the next three years. National objectives, certainly in the case of the Saudis, even include space launch capabilities – always a sign of mature strategic intent on the road to space power.³⁴

³⁴ A new report by Euroconsult predicts space revenues of over US\$75 billion by 2032 in the Middle East. See: ‘Beyond the Stars: the Middle East’s Space Ecosystem on the Move’, Euroconsult, 04/01/2024, <https://www.euroconsult-ec.com/> (checked: 19/01/2024).



5.0 Europe and space

Although home to some of the most exquisite space technology and science centres in the world, and despite early demonstrations of space prowess during the Cold War when it was clearly – in aggregate – the third ‘space power’ in the world after the US and the Soviet Union, European countries have fallen behind in terms of contemporary ‘astro-geopolitics’. As Kai-Uwe Schrogl, an Adviser to the European Space Agency (ESA), has noted: ‘Europeans are far away behind the PRC in human space flight and the moon exploration, [but] we still have a big lead in Earth observation and in navigation.’³⁵

European countries have resisted the concept of space power, and do not have the ambition to establish themselves as global space powers. The European approach to space investment is subject to the logic of **economic return**; despite the rhetoric, it is not driven by real considerations of geopolitics or strategic autonomy. Fundamentally, this is a political problem.

The country with the most mature understanding of space power is France. But France’s authority on European space strategy is undermined by the fact that it is also the source of Europe’s greatest failure: the long-running and increasingly expensive and inefficient Ariane rocket programme. For the first time since the 1970s, no European country has, at present, autonomous access to space due to delays to Ariane 6 and problems with Vega. These circumstances, requiring a re-distribution of space funds towards propping up the European’s launcher programme, have also led to the failure of the ESA’s *Revolution Space* initiative, the agency’s flagship strategic vision for European space power, launched in early 2023.³⁶

More broadly, at the policy level, European thinking on space has followed in the slipstream of the broader recognition, over the past eight years, of the need for the European Union (EU) to enhance its role on the world stage in response to escalating global competition.³⁷ In particular, the separation of Britain and the EU led to a renewed focus

³⁵ Catherine de Beaurepaire, ‘Europe’s space program plays catch-up with China and India’, *Nikkei Asia*, 19/11/2023, <https://asia.nikkei.com/> (checked: 19/01/2024).

³⁶ See: Gabriel Elefteriu, ‘Europe’s new ‘Moonshot’ space plan: How should Britain respond?’, Council on Geostrategy, 06/06/2023, <https://www.geostrategy.org.uk/> (checked: 19/01/2024).

³⁷ See: ‘A Global Strategy for the European Union’s Foreign and Security Policy’, External Action Service (European Union), 2016, <https://www.eeas.europa.eu/> (checked: 19/01/2024).



on intra-European cooperation on defence as shown by the establishment and increasing use of Permanent Structured Cooperation (PESCO)³⁸ – and, in the context of Russia’s war against Ukraine, initiatives such as the Act in Support of Ammunition Production (ASAP).³⁹ Space had long been identified as an important element of the EU’s defence agenda, and Ursula von der Leyen’s ‘geopolitical Commission’ vaulted this domain to institutional prominence by including it in the very title of the newly-created ‘Directorate-General for Defence Industry and Space’ (DG DEFIS) and also recognising its importance in the 2022 Strategic Compass on Security and Defence.⁴⁰

Most notably, in 2023, the European Commission released the first EU Space Strategy for Security and Defence (SSSD), presented at the time as a ‘paradigm shift’.⁴¹ However, this description is more appropriate for the *bureaucratic* aspects of its provisions than for its *practical* ones, insofar as the strategy finally coheres some aspects of policy and gives certain themes – such as the ‘space threat landscape’ or ‘resilience’ – a clearer focus within the official purview of EU policy-making. But the SSSD does not offer a comprehensive vision of building and using *space power* for military purposes – including counter space – while its engagement with security issues is limited to the passive approaches such as the Space Domain Awareness (SDA) mission or ‘attributing’ hostile actions. Doubtless, the SSSD is an important first step towards a serious EU approach to space strategy, but there is much more to do, particularly in terms of joint capability development and more assertive policy objectives.

In the national security sphere, continental Europe’s aggregate space power – considered across the sovereign capabilities of the main European space nations and the EU – is significant across all major categories of satellite services. To the more than 30 government-owned remote sensing spacecraft currently in operation must be added the European Commission-owned Copernicus constellation of six highly-capable satellites. Beyond this, European countries are home to four separate defence-grade national satellite communication systems

³⁸ See: Permanent Structured Cooperation (PESCO), European Union, No date, <https://www.pesco.europa.eu/about/> (checked: 19/01/2024).

³⁹ See: ‘Act in Support of Ammunition Production (ASAP)’, European Commission, 23/11/2023, <https://defence-industry-space.ec.europa.eu/> (checked: 19/01/2024).

⁴⁰ ‘A Strategic Compass for Security and Defence, External Action Service (European Union), 24/03/2022, <https://www.eeas.europa.eu/> (checked: 19/01/2024).

⁴¹ ‘EU Space Strategy for Security and Defence’, European Commission, 09/03/2023, <https://defence-industry-space.ec.europa.eu/> (checked: 19/01/2024).



(totaling about 12 spacecraft), while the European Commission is also in the process of procuring a secure multi-orbit space broadband system ('IRIS2') which is projected to include at least 170 satellites.⁴² Finally, the EU benefits from its own GNSS in the 28-satellite Galileo system.

Tables 2 and 3: Key military/government satellite systems in Europe⁴³

Designation	Full name	Type	Satellites
SPOT	French	EO/ISR	1
Helios 2	French	EO/ISR	2
Pleiades	French	EO/ISR	4
COSMO-Skymed	Italian and Italian/French	EO/ISR	6
SAR Lupe	German	EO/ISR	5
SARah	German	EO/ISR	2
TerraSAR-X	German	EO/ISR	1
TanDEM-X	German	EO/ISR	1
CSO	French	EO/ISR	2
PAZ	Spanish	EO/ISR	1
Deimos	Spanish	EO/ISR	2
ELISA	French	EO/ISR	4
CERES	French	EO/ISR	3
Total			34

Designation	Country	Type	Satellites
SatcomBw	German	Satcom	2
Syracuse	French	Satcom	4
Secomsat	Spanish	Satcom	2
Sicral	Italian	Satcom	2
Heinrich Hertz	German	Satcom	1
Athena-FIDUS	French/Italian	Satcom	1
Total			12

As in the case of the US, European countries and the EU can also draw upon commercial capabilities if required. Even though the European space sector is much smaller and far less diverse, there are a range of private operators such as the French Eutelsat – which has

⁴² See: 'IRIS2: the new EU Secure Satellite Constellation', European Commission, No date, <https://defence-industry-space.ec.europa.eu/> (checked: 19/01/2024).

⁴³ Data from: Union of Concerned Scientists, UCS Satellite Database, 01/05/2023, <https://www.ucsusa.org/> (checked: 19/01/2024).



acquired OneWeb, currently the second-largest mega-constellation project after Starlink – or the Finland-based Iceye, which can contribute some capability in a crisis.

But this relatively impressive set of capabilities obscures a more uncomfortable truth when it comes to European space power: the fact that it is, as noted above, only an artificial *aggregate* of what, in reality, are rather distinct *national* programmes governed by separate agendas, priorities and sovereignty concerns. In other words, in the geopolitical context of space affairs, there is arguably no such thing as ‘European’ space power – but only French, German, and so on.

‘Europe’, taken as a shorthand for the ESA, is indeed a major global player in the strictly limited field of civil and scientific space activities: it is a space-science powerhouse. But the collective European excellence achieved in this area – which, as already noted, is rapidly becoming insufficient in the face of intensifying geopolitical competition – was enabled precisely by the ESA framework which imposes certain patterns of practical cooperation and coordination on its members. Unfortunately, these have, historically, been limited strictly to non-military projects.

There is no equivalent of these sorts of ESA-type arrangements in the *security and defence* sphere of the space domain, at the European scale. States differ both in their understanding of the role and integration of space in military planning, and in their economic interests as each wants to support its own national industry. The prospect of sharing highly sensitive and classified information and technology on a systematic basis is likewise subject to – and indeed limited by – considerations of trust.⁴⁴ This prevents the development of *joint space systems requirements* at pan-European level – the first step towards building a coherent *European* defence space architecture with shared capacities and services. Instead, it perpetuates not just duplication and inefficiency, but, more importantly, this state of affairs prevents the development of a common and *realistic* European vision for the military component of space power (see: Box 1).

⁴⁴ An excellent discussion of these matters is offered in: ‘Space Systems Supporting Security and Defence: A new European approach’, Air and Space Academy (France), 06/04/2019, <https://academieairespace.com/> (checked: 19/01/2024).



Box 1: How Europeans could generate space power

1. European policy makers ought to fundamentally reappraise how they approach space affairs. The ‘return on investment’ logic for supporting space activities – often paired with a *soft* rationale that emphasises the civil benefits of space services – must give way to a *harder* logic of public investment in this domain based on the *strategic* value of space power in advancing European interests in the world. Importantly, this conceptual shift should also include the complete lifting of the traditional European taboo over considerations of security and defence in relation to space. With war now on Europe’s doorstep, the notion that strategic questions of space security – including, for example, a European *counterspace* capability – can be ignored, is no longer tenable.
2. Europeans should dial down their protectionist instincts and self-defeating ideology of ‘strategic autonomy’ and adopt a radically different attitude – mediated by policy and regulation – of openness to non-European commercial (and indeed government) actors who would want to participate in European programmes. This would facilitate flows of both foreign investment and technology into Europe, removing the need for European countries to duplicate at great cost technologies – such as in space transportation – that are already mature and being provided commercially elsewhere, and instead focus on other high-end capabilities.
3. Europeans should look to create new institutional mechanisms, with new and more flexible authorities, for managing and helping to finance major new jointly-owned projects. In this sense, proposals identified in previous Council on Geostrategy research include: a European Space Investment Corporation, to promote commercialisation and investment; a European Cis-Lunar Organisation, to own the relevant space assets that Europe will wish to deploy in the future in Earth orbit and at the Moon; and a space venture capital arm (ideally under ESA) similar to Central Intelligence Agency’s In-Q-Tel.



6.0 Conclusion and recommendations

Space has matured into a strategic, diplomatic, and economic domain of increasing importance to national and international security and to European prosperity. But it is all too often framed in policy and academic debates as somehow beyond strategic logic or as a wasteful distraction from more pressing priorities on Earth. Therefore, there is a major and obvious disconnect between the strategic importance – and potential – of space and its comparatively low recognition and political prioritisation by European leaders and policymakers.

As space affairs become more central in geopolitical calculations, there is a clear need to **educate European policymakers** and public opinion in these complex but increasingly crucial questions. There is no substitute for political grasp of these issues, which are as *political* at their core as any other area of national policy; the reputation of space as a highly-technical field should not obscure this fact.

Problems such as access to orbital resources such as spectrum or orbital slots, space weapons, or the deployment of space-based solar power infrastructures, will require a degree of understanding at the top level, and a degree of consensus globally.

There is now an increasingly urgent need, as well as an expanding strategic opportunity, for countries supportive of an open international order to collaborate more closely and develop new joint constructs for advancing their shared interests for both security and economic benefit. At the same time, it is imperative that such efforts be understood and undertaken within a very clear, ‘astro-realist’ intellectual framework which accounts for the strategic reality of geopolitical competition facing the world in space as well as on Earth.

The first area for action is the lethal problem of orbital congestion, which, if left unaddressed for much longer, is likely to degrade the entire space operating environment. The traditional approach, so far, has been to try to negotiate international agreements on rules and norms on space sustainability through the United Nations. It is now clear to many observers that this process is not only too slow, but unlikely to ever produce consensus given the prevailing state of international affairs.



Instead, free and open nations should create a **‘coalition of the willing’ on space sustainability** – an approach not dissimilar to the Artemis Accords – in which European actors such as the UK and the EU could play leading roles. The purpose would be to align their regulations and foster new norms of behaviour among private actors – particularly mega-constellation operators who are responsible – by leveraging national market-access rules, such as spectrum landing rights. These can be tied to compliance with space sustainability standards agreed jointly by coalition members.

Tighter collaboration could also be pursued by developing new mechanisms to **stabilise geopolitical competition in space**. Again this requires a strong dose of realism. Seeking UN consensus, especially among the Permanent Five members of the Security Council, on anything approaching a new, legally-binding international space security agreement – which is the only ‘guardrail’ which can ultimately regulate military space competition – is effectively impossible. The current approach, seen in the ongoing attempts to promote *voluntary* moratoriums on ASAT testing, is ineffective in dealing with revisionist states such as Russia which simply reject it.⁴⁵

In this context, free and open nations could **enhance transparency** in terms of space operations, so as to be able to hold to account irresponsible behaviours with clear evidence which can be released in the public domain. This would require the creation of joint or jointly-controlled SDA capabilities – both by sharing data from existing space systems, and perhaps by procuring *new* systems for this particular mission, particularly space-based space surveillance satellites in different orbital regimes.

Another but much more sensitive and complicated pathway – which can run alongside the transparency track – is to establish a **space deterrence initiative**, most likely under the aegis of NATO, but a more ambitious Europe could play an important role from the start as well. *Space deterrence* is an even less understood and developed concept than *space power*, so this would be a very difficult undertaking – but the sooner free and open nations create a framework for discussing and evolving their coordination in this area, the better. Since this effort would start with purely conceptual and policy coordination, there would be less political risk attached to it. Space deterrence is also an

⁴⁵ Jeff Foust, ‘United Nations General Assembly approves ASAT test ban resolution’, *SpaceNews*, 13/12/2022, <https://spacenews.com/> (checked: 19/01/2024).



area where Europeans as well as NATO can develop concrete dialogues and points of strategic contact with Indo-Pacific partners such as Japan, India and Australia.

Finally, Europeans could help establish an **Intercontinental Space Alliance**. With support and leadership from European nations and even the US, this alliance could also group space agencies from select Indo-Pacific partners including Canada, Australia, New Zealand, India (which is second only to the PRC, in the region, by volume of space launches), Japan and South Korea, as well as, potentially, South Africa and Gulf states such as the UAE.

In a similar fashion to the ESA, the alliance would have a common budget with contributions from member countries, and it would allow for the joint research and development, procurement and operation of common capabilities of greater scope and capacity than any single member could develop on its own. Like with ESA, projects could range across both scientific applications (including space exploration), civil applications (for example, advanced EO systems for environmental and maritime monitoring, or broadband connectivity, across the vast oceanic expanses of the Indo-Pacific), and across defence and security (from GNSS to SDA).

There is a great opportunity for long-standing ESA members to apply their experience to a *new* endeavour with a broader geography. The initiative could start small, with select countries in Europe and the Indo-Pacific establishing an initial framework, connecting key parts of their space industrial bases, pooling specific resources and establishing a jointly-owned space project where European actors can leverage their strongest advantages, such as in space science or Earth observation.

To summarise, space is increasingly central to critical national infrastructure, as well as commercial activity. It has become a centre of gravity which Europeans should be prepared to defend, and also use to advance their geopolitical interests. Space power is shifting conventional military balances, both in the land domain and in the maritime domain – trends which are set to accelerate as new, transformational space technologies are introduced in the years ahead.



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Notes

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