

REACH OR RETREAT

POWERING BRITAIN'S SPACE INDUSTRY

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About Labour Tech

We are a group of professionals with experience in the technology sector and members of the Labour Party, working together to help shape forward-looking policies. We collaborate with experts from industry, academia, and politics to support ideas that drive progress. Britain needs growth now more than ever, and by supporting our homegrown technology sector, we can help deliver the economic renewal our country urgently needs.

labour-tech.org.uk

All experts featured in this report are independent of the Labour Party.



About TYI

TYI's (The YIMBY Initiative) expertise reflects our mission as a pro-growth, pro-abundance think-and-do-tank seeking to create a safe, secure and prosperous United Kingdom.

We are committed to supporting strategically important sectors with a team that has decades of experience in the public and private sectors, working across housing, strategic planning, local to national government, defence, public affairs, advocacy, development of advanced technology, cutting edge research, and policy development.

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Britain's New Space Age: A Mission for National Renewal



Kira Lewis

Vice Chair, Labour Tech

Britain stands at the threshold of a new space age. Space is no longer a distant frontier, it is becoming the foundation of our digital economy, a driver of jobs and skills, and a pillar of national resilience. Under this Labour government, this sector can be the cornerstone of inclusive growth, linking science and innovation to real jobs and growth benefits for communities across the UK.

Space is multifaceted and underpins everything from secure communications and navigation to climate monitoring, disaster response, and energy systems. Satellites in Space are helping Ukrainians to fight for ground leverage every day. It is the infrastructure behind modern life, enabling financial transactions, logistics, and connectivity. As the world moves toward an in-orbit economy powered by AI, robotics, and quantum technologies, Britain must decide whether to lead or follow. The choice is stark: act boldly now, or risk losing ground in trillion-pound markets that will define the next century.

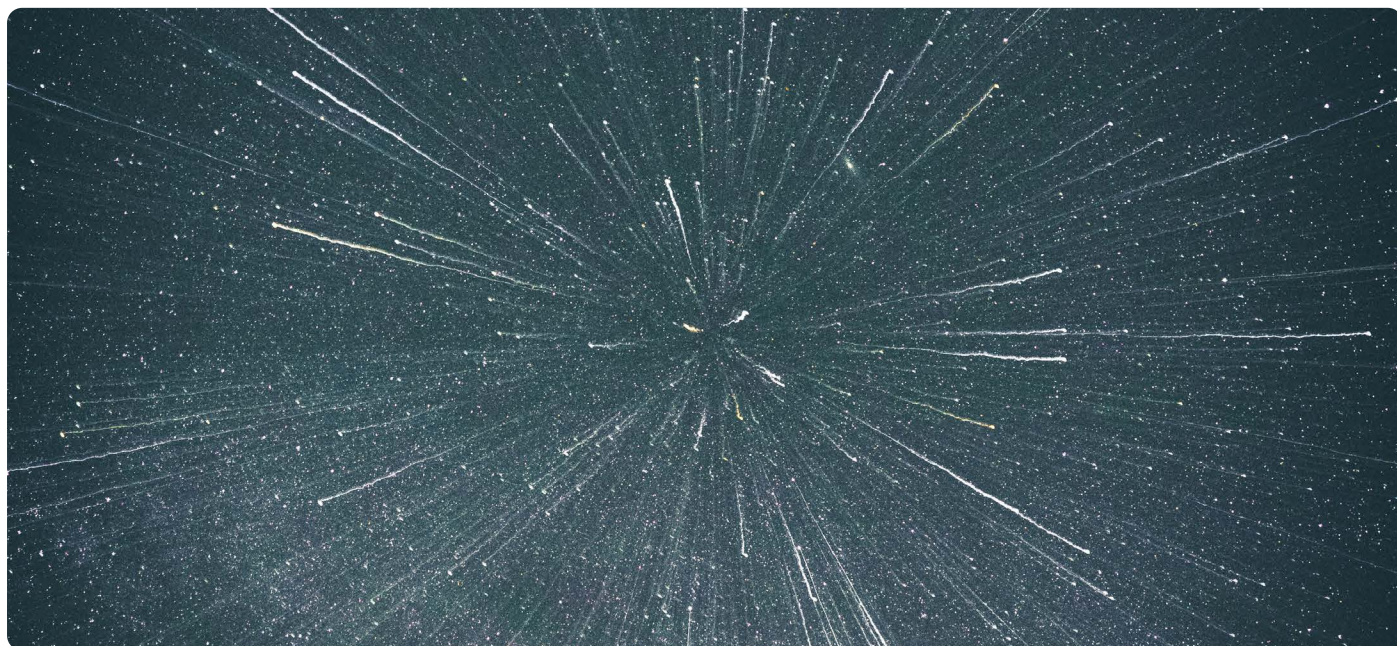
Our nation already has world-class capabilities. We lead in small satellites, Earth observation, and in-orbit servicing. We have pioneering missions like Ariel, innovators developing quantum-safe operating systems, and companies such as Space Solar working to deliver clean energy from orbit. Regional clusters like the Harwell Campus show how space can anchor local economies and inspire STEM education. These strengths give us a platform to build on, but structural challenges

remain. Space, like other technology and defence sectors, faces fragmented funding, slow procurement, and talent leakage which threatens our ability to scale.

Labour's opportunity is clear. We must work to craft a coherent national space strategy that treats space as foundational infrastructure, not a niche. That means integrating space into industrial policy, energy planning, and national security. It means creating agile funding models, speeding up procurement, looking for new opportunities to include Space projects in funds and to more actively encourage private investment. It means embedding space within our missions for climate action and economic fairness – using satellites to monitor emissions, secure communications, and deliver smarter public services. And it means investing in people, building good, secure jobs across the country.

This document brings together voices from across the sector – scientists, entrepreneurs, and policy advocates – to outline how Labour can unlock Britain's space future. Our next growth frontier.

The message is simple: Space is the foundation of a modern economy. If we move decisively, it can be a story of optimism and shared prosperity. If we hesitate, we risk losing ground in a century-defining industry. The time to act is now.



Growth on the Ground: From Banbury to the Stars



Sean Woodcock MP
Member of Parliament for
Banbury

Kickstarting economic growth. That was the number one mission of the Labour Party ahead of the last General Election.

There has been some progress. The UK had the highest growth in the G7 at the start of 2025, but it has not been all plain sailing. Tariffs and the need to raise revenue to fix the damage to our public services left by the Tories has undoubtedly played a part in us not yet getting the country to the place we would like it.

My constituency, Banbury, is an interesting case study.

Technically part of the South East, the UK's wealthiest region, and part of Oxfordshire in the Thames Valley, it is one of the few areas of the UK to make a net positive contribution to UK GDP.

Among the people I can list as my constituents are David Beckham, Jeremy Clarkson and an ex-boss of a major high street bank; the "Chipping Norton set".

Yet while we have our share of advanced industries, there are multiple pockets of deprivation with three of the ten most deprived council wards in the county, among the top 20% most deprived in the region, in Banbury itself.

The government has committed to the Oxford to Cambridge Growth Corridor, which we are on the edge of, which should benefit us. Space will clearly feature as part of this knowledge spine and the knock-on effects could be of real benefit to my constituents.

At Harwell Campus, more than a hundred space and wider science organisations have created a genuinely world-leading cluster, contributing to data analysis, climate science, advanced manufacturing and the technologies which will define our future. The National Satellite Test Facility at Harwell is a world-leading site for firms of all sizes to develop and test their spacecraft, with its first testing campaign being for the UK's military satellite communications system, reflecting the importance of our area's scientific prowess for protecting our country.

These firms create pathways for young people from across the county to forge careers in the industries of tomorrow.

Indeed, Banbury Futures Academy, a comprehensive secondary school in the town, focuses on the teaching of maths, physics and associated subjects. It was founded under a different name; Banbury Space Studio. The benefits from a thriving science and space industry on our doorstep to its pupils, are obvious and can be replicated nationwide.

Oxfordshire, however, will only remain an attractive place for global investment in industries such as space if we make a very clear decision to welcome it. We need an active industrial strategy, including more housing for our local workforce; an education and skills system which reflects the needs of the modern economy, including advanced vocational training; and improved transport infrastructure.

We need joined-up government, reflecting the contribution made by places like Oxfordshire to innovation and GDP, and deliver all of those facets of policy which will give our area a fighting chance against the economic might of the United States and China. We need to retain our best industrial and scientific talent, but young people cannot afford housing and childcare. That needs to change.

A joined-up industrial strategy would bring to bear all areas of government, from science to transport to defence procurement, to support our pockets of global excellence.

If we are ambitious then space, and advanced research and manufacturing industries like it, can open new opportunities for national renewal, creating remarkable opportunities for future generations.

Executive Summary

This report argues that the UK's burgeoning space economy, critical for national resilience, growth, and security, is at a crossroads and requires urgent, coherent government action to prevent losing ground in a £2 trillion global market. The choice is to act boldly now or risk ceding leadership to international competitors.

Key Findings and Strategic Recommendations:

- **Fragmented Governance:** The UK lacks a **lucid space ambition, vision, and plan**, with responsibility and funding currently fragmented across multiple government departments (DSIT, MOD, FCDO, etc.).
- **Unified Budget:** Government must **merge all civil and military space budgets** into a single national capital-resource programme to maximise spending power and catalyse private finance.
- **National Strategy:** Publish an updated, mission-driven **National Space Strategy** supported by a 10-year implementation plan with defined outcomes and resourcing.
- **Scale-up Capital:** There is a critical **"scale-up cliff"** due to a lack of growth-stage capital (Series B/C funding), driving UK space companies abroad. A dedicated 'Space Growth Fund' is needed to retain IP and talent onshore.
- **Anchor Customer Role:** The government should act as an **anchor customer** through predictable, multi-year procurement pipelines to incentivise domestic manufacturing and help UK firms grow and export, particularly in **downstream services**.
- **Regulatory Speed:** Regulatory and licensing structures must be **reformed and streamlined** to match the pace of technical innovation, preventing slow approvals from strangling fledgling companies.
- **Focus on In-Orbit Economy:** Prioritise investment in **next-generation infrastructure** such as Space-Based Solar Power (SBSP), in-orbit servicing and manufacturing (IOSM), and orbital data centres, which represent multi-trillion-pound market potential.
- **Talent and Skills Gap:** Invest deliberately in **skills pipelines**, including postgraduate engineering centres, apprenticeships, and regional skills partnerships to create high-productivity jobs across the UK and address talent leakage.
- **Leverage Quantum:** Exploit the UK's quantum strengths to deliver more precise and resilient services, focusing on **Quantum Position, Navigation, and Timing (PNT)** and sensing for critical infrastructure.
- **User-Centred Design:** Implement **Human Factors Integration** and best practices (like those used in Defence) into system design to standardise interfaces, reduce training time, and improve the safety and effectiveness of spacecraft operations.
- **Global Financial Hub:** Strengthen London's role to become a global **'space finance centre'** by structuring complex transactions, extending insurance products, and leading the flow of capital.
- **Regional Growth:** Ensure space investment contributes to **regional growth, levelling-up, and social benefit** by linking clusters (e.g., Harwell, Glasgow, Cornwall) and requiring SME participation in major contracts.

Securing the Final Frontier: Britain's Space Economy Challenge



Air Marshal Andrew Turner CB CBE
CEO of Saibre Capital

The space economy is no longer a niche domain of governments and scientific agencies; it is a dynamic, expansive commercial frontier touching everything from global communications to earth observation, climate monitoring, national security, and ambitious downstream data-services markets. The best forecasts speculate that the global space economy will grow to close to £2 trillion by 2035. There is a piece in here for all those who have ambition, extend a bold space vision and back it with a plan.

The UK should be at the front of this queue with its strong space pedigree, engineering and satellite-manufacturing know-how, vibrant financial services sector and academic talent. However, whilst the opportunity is substantial and the competition from the United States, Europe, Asia and new entrants fierce, the UK lacks a lucid space ambition, vision and plan.

Strengths and challenges

The UK has a strong base in manufacturing satellite components, control systems, mission engineering and software. British firms (large and small) participate in major ESA programmes and global commercial constellations. The UK should double down in these areas and aim to lead in targeted and specialised niches (e.g., small-sat propulsion, optical satellites, data-analytics for EO).

London is a hub to convene ideas, policies, capital and capability, but it needs to translate this into a space strength – raising capital, structuring complex transactions, brokering and extending insurance products and growing downstream services such as satellite-data analytics, fintech applications, and Space-as-a-Service models. The UK should become a global 'space finance' centre.

National security is now won and lost in space. The UK government recognised this in the Strategic Defence Review, but must back the idea with resource – cash, commitment, creation or curation. Determination, direction and investment is vital to secure a continental space security leadership role and not cede the opportunity to others.

Investment is critical to building the UK space economy, but Government should be seen as a financial catalyst not the sum of investment in capability. The UK lacks growth-stage capital for space ventures which drives space companies abroad to scale. We generate the best intellectual property but see little return for it, so we must grow the capital facilities to scale on shore.

UK-based launch could be a complete distraction. The Government has backed several ventures, but our geography and launch trajectories will ultimately constrain what's possible and cede the bulk of commercial revenue to the fierce competition. It may satiate political interest and symbolise national space ambition, but there is a good chance that the UK space launch arithmetic does not add up.

If the UK is to think more carefully about where to place its bets, it needs a conversation on capabilities that drives investment. Successive administrations have developed priorities, but there is no plan to achieve any of them. The absence of a plan is the result of a failure to plan, and this frustrates industry and repels the markets. The UK desperately needs a plan for space.

How Government can help

There is a huge opportunity for the UK in space, but there is much to be done if it is to be realised. Firstly, Government must develop and **publish a mission-driven policy framework** – what is it that we are trying to achieve and why. This refreshed National Space Strategy must be supported by a 10-year implementation plan which identifies the what, who and how delivery will occur, defines the outcomes and apportions resources. Spread-betting is for those that don't know what to do; we need to pick winners to coordinate public funding, give direction to industry and attract global partners.

As UK Space Command promotes, we must choose which space services we want to own, collaborate on or access. Government procurement is a powerful lever, but it is frittered away through parsimonious grant distribution. We need to **be bolder about how public finance is injected** and allocate multi-year finance into UK firms to incentivise the market and allow our best companies to grow. Conversely, wobbling creates waves of divestment.

Almost every space capability is dual-use which means that military and civil space programme benefits are indivisible. Given this, Government should merge its space finances – MoD, HO, FCDO, DSIT, others – into **a single national space budget**. This would give UK real spending power, catalyse private finance and elevate corporate leverage. Directing the development of dual-use (both directions) outcomes in contracts would cement this thinking and stimulate sales into diverse markets.

The UK should **create a dedicated space growth-stage fund** to bridge the ‘valley of death’. Carved out of the National Wealth Fund, seeded with Departmental capital, and targeting Series B/C investment, this would trigger City investment and retain UK companies onshore.

The UK should **lead the emerging space nations** with experience, ideas, conceptual support and capability partnerships in return for inward investment. They specifically seek a UK supporting hand (explicitly resisting the French and US approaches) to buy out absences of ambition, capital or expertise and want to invest in UK with a plan to build skills and transfer tech over time. This is an open goal.

We must **reform regulatory and licensing structures** to speed growth. As we have seen in Ukraine, the pace of technical innovation has been remarkable but theirs was enabled by sovereign regulatory agility. This applies to the space sector where slow regulatory approvals strangle fledgling companies through debt interest accrual and long lead times to revenue. If the UK is to compete we must align regulatory frameworks with or ahead of international leaders to attract intellect, industry, investment and operators, rather than drive them offshore.

The foundation of the sector is its skills, talent and innovation ecosystems all of which need a boost. UK investment is needed in postgraduate space-engineering centres, apprenticeships, conversion courses for data/AI engineers into space-services roles. We should encourage greater collaboration between universities, technical colleges and industry via ‘space innovation hubs’ for small-sat fabrication, propulsion test rigs, data-analytics labs and incentivise inward migration of high-skill space professionals.

Too often the space economy is seen as being about rockets and astronauts, but the bulk of the financial return is in data. This is a lower investment risk than things that go bang and in an area of UK advantage – data analytics, remote-sensing services, connectivity. The UK should seek to **become a global exporter of space-based services** e.g., agriculture monitoring, maritime surveillance, insurance-risk modelling, and the Government should be an anchor customer to help UK firms grow and export.

A road-map for action

By 2026:

- Publish an updated National Space Strategy
- Merge Government space budgets into a single capital-resource programme of work
- Build a Government-Industry-City space finance alliance
- Launch a ‘Space Growth Fund’ (public seed + anchor investor) focused on Series B/C deals
- Establish a ‘National Space Regulatory Unit’ to streamline licenses and export controls
- Build a skills pipeline: launch apprenticeships, scholarships in space engineering/data science

By 2027:

- Deploy £10 billion Government capital into domestic satellite/data services contracts
- Match Government spending with 3x private capital building a £40 billion investment plan
- Consolidate UK Government space services into a national interest satellite constellation
- Deliver Global resilient precision time
- Deliver a space-derived global live digital twin using space observation and internet of things data
- Lead the World in horizontal launch
- Expand export-promotion with UK trade, trade-finance guarantees
- Grow downstream services with the Government as an anchor customer for satellite-data
- Grow an emerging space nations programme of support

By 2030:

- Scale-up UK space investment ecosystem reaching £1b+/year in growth-stage funding
- Catapult UK space downstream services revenue to >£5 billion/year by 2030
- Secure UK as a recognised global hub for space finance, insurance, data and downstream services

Much is possible inside this Parliament and even more by the close of the next, but the pathway needs framing and colouring in. If the Government adopted these approaches it could catalyse the GDP benefits to the UK space sector set out in Table 1.

Lever	KPI	5-Year Target
Investment	Capital raised by UK space firms	> £1bn per year by 2030
Export revenue	UK space exports (goods and services)	5x in 5 years
Employment	Skilled FTE jobs in space sector	50% growth
Supply chain	Number of UK space suppliers	Increase by 100%
Downstream revenue	Satellite-data services export revenue	> £5bn per year by 2030

Table 1. Illustrative growth levers, KPIs and targets

The UK is well-placed to become a global leader in space, but this demands more than ambition. It requires a strategy, plan, Government-consolidated and catalysed investment and regulatory support. If the UK built upon its strong engineering and financial services base, addressed its capital/talent/supply-chain gaps, and used public procurement and infrastructure to catalyse growth, it could carve out a world-leading role

in small-satellites and data services. This would drive economic growth, high-skilled jobs and social mobility and buttress security in an era where it is won and lost in space.

Fortune favours the brave and drifting is deleterious to the economy and endangers our society.

Unlocking Britain's Space Tomorrow: A Labour Agenda for Growth, Skills and Sovereignty



Rajesh Agrawal
Space4Labour

A moment of opportunity

Britain's space industry is growing faster than many realise. It now employs more than 55,000 people directly and supports another 80,000 across the supply chain, with an annual turnover of around £18 billion. From satellite communications and Earth observation to launch and in-orbit services, the UK has the chance to be one of the world's leading space nations if we get policy right.

For Labour, this is more than an industrial success story. Space touches almost every mission the party has set for government: driving economic growth, building national resilience, boosting science and innovation, tackling climate change and delivering opportunity across all regions. But that potential will not realise itself. It requires active government partnership, long-term investment and a plan to ensure the benefits reach every part of the country, not just the South East or the Harwell cluster.

From rockets to regions

The UK's new Labour government has already begun re-examining how space fits into a modern industrial strategy. The planned integration of the UK Space Agency into the Department for Science, Innovation and Technology (DSIT) offers an opportunity to align funding, regulation and industrial strategy. Used well, this reform can support the kind of mission-driven approach Labour has championed: joining up science, skills, manufacturing and exports.

The UK's emerging launch sector in Scotland, satellite manufacturing in the Midlands, space data companies in Wales and engineering firms in the North demonstrate what a balanced national space economy could look like. Yet many smaller companies still struggle to scale. *Space4Labour's* discussions with industry show that British firms excel at innovation but too often face a "scale-up cliff" when moving from prototypes to production, due to a lack of patient capital and long-term procurement signals. Labour can fix that by creating a predictable pipeline of public contracts, export-credit support and partnership funding that rewards UK content and local employment.

Sovereignty, security and public good

For Labour, space is not just about economic growth. It is also about sovereignty, resilience and fairness. Secure access to space-based services is now as essential as energy or digital connectivity. Navigation, communications, financial timing systems and even NHS logistics depend on satellites. A Labour-led approach must therefore embed space within our national security and industrial strategy, building sovereign capability in areas such as Positioning, Navigation and Timing (PNT), Earth observation, in-orbit servicing and satellite manufacturing.

At the same time, space technologies must deliver public value. Satellites monitor climate change, track deforestation, support disaster response and enable smarter agriculture. By linking these capabilities to public service missions, from net zero delivery to food security, Labour can show that space is not a luxury or a vanity project, but a tool for social progress.

Jobs, skills and inclusion

Perhaps the most important Labour dimension of space is its potential to create good work: skilled, well-paid, union-friendly jobs that spread opportunity beyond London and the South East. The space sector already employs more than twice the UK average in high-productivity roles. But to make it inclusive, we need deliberate investment in training, apprenticeships and pathways for under-represented groups.

Labour can build on existing strengths in regional clusters such as Glasgow, Leicester, Cornwall and Harwell by funding skills partnerships between local colleges, universities and industry. A Space Skills and Inclusion Programme, linked to regional growth funds, could train the next generation of engineers, data specialists and technicians, making space part of the wider levelling-up story.

Inclusion also means ensuring small and medium-sized enterprises (SMEs) are part of the journey. A targeted SME participation requirement in major contracts would help spread opportunity through the supply chain and give innovative firms a route into government work. Space4Labour is already advocating for this through its engagement with industry and Parliament.

Space also has a unique role in inspiring the next generation. Few subjects capture the imagination of young people as powerfully as space; it is often their first gateway into science and engineering. This makes

the sector not only a source of skilled employment, but also a vital part of the UK's STEM education story. By connecting the excitement of space exploration to classroom learning and the national curriculum, Labour can use space to spark curiosity, raise aspirations and encourage more children to pursue science, technology and engineering, building the foundation for Britain's future innovation economy.

A progressive space industrial strategy

For Labour, one of the next big questions is who **owns space in government**.

Responsibility is currently fragmented between DSIT, the Ministry of Defence, the UK Space Agency and other departments. If the UK is to have a coherent national space programme — one that links civil and defence policy, industrial growth, science and security — there must be clear leadership at the centre of government.

Whether that takes the form of a minister with cross-cutting responsibility, a Cabinet Office role or a senior adviser within Number 10, Labour should explore a model that gives space the political visibility and strategic coordination it deserves. This is one of the key policy areas that *Space4Labour* will continue to examine and champion in the months ahead.

Alongside that leadership, the next stage must be to embed space within Labour's broader economic and industrial vision. That means:

- **Clear procurement pipelines** that reward UK capability and support domestic manufacturing.
- **Regional investment funds** focused on innovation, training and cluster development.
- **Public-value metrics** for government space spending, ensuring projects contribute to national resilience and social benefit as well as commercial return.
- **International partnerships** that leverage Britain's strengths in science, data and regulation while keeping production and skills at home.

The UK has a proud heritage in aerospace and satellite technology, from early pioneers at Farnborough and Filton to today's innovators at Skyrora, Open Cosmos, Satellite Vu, Clear Space and Astroscale UK. A Labour-driven industrial strategy can turn that heritage into future growth: backing new manufacturing, ensuring stable regulation and embedding sustainability from the start.

Looking forward

The space sector offers something rare in British politics: a story of optimism, science and possibility. Yet it will only reach its potential if it aligns with Labour's missions — growth, jobs, skills and fairness. *Space4Labour* was founded to make that connection, ensuring that as the UK reaches for orbit, it takes the whole country with it.

Under Labour, space can become a cornerstone of a modern, fair and resilient economy — one that builds the satellites and launchers, trains the workforce, and uses the data to improve lives here on Earth. That is the promise of a Labour approach to space: not space for prestige, but space for people, and for Britain's future.

Ariel and the Next Horizon: UK Space Leadership in Action



**Rebecca
Coates**



**Costanza
Azzini**

Space is one of the most challenging and rewarding fields of innovation, and the UK is at the forefront of it in the Ariel Space Telescope, where it leads a consortium of 600+ scientists and engineers across ~16 countries in a mission to explore exoplanet atmospheres and uncover the mysteries of the planets in our galaxy, with the European Space Agency, NASA, JAXA, and the Canadian Space Agency (CSA).

The UK investment to Ariel delivers scientific, engineering, and programmatic leadership which – together with industrial return secured through ESA contracts to Airbus UK and SMEs – provides first-hand experience with the challenges and policy opportunities of the UK space sector.

UK Space Sector Strengths and Focus

The UK is a world leader in small satellite technology, telecommunications, robotics and Earth's observation.

The UK invests around 1% of global government spending in space, yet captures approximately 5% of the global space market.¹ Additionally, the UK is globally recognised as an attractive destination for private investment in the space sector, ranking second only to the US between 2015 and 2022.²

UK universities are among the best in the world for space science – fourth in the world for publications of space research, and reported in 2020 to have the second largest share of the most highly cited scientific papers in space literature.³

The UK holds a rich heritage in Space, with pioneering research into Space Law and Policy reaching as far back as the fifties.⁴

A Barrier to Growth: Fractured Funding

However, there are hurdles that prevent UK Space from reaching its full economic growth potential. In a contribution to the House of Lords call for evidence of UK Space Engagement, we highlighted a particular issue with the funding of scientific preparatory work for Ariel.⁵

Funding

For most space science activities, and particularly a mission like Ariel, it is crucial that science and engineering funding go hand in hand in order to fully exploit the opportunity and expertise such a mission offers.

UKSA has supported the building and management of the Ariel instrument – the engineering, but its institutional constraints do not allow it to fund the subsequent scientific work. UKRI might possibly fund scientific exploitation work once the telescope produces data post-launch, however crucial preparatory work currently underway is only funded piecemeal through fixed period research grants. This hinders the ability to maintain necessary expertise cultivated through years of mission development.

What this means in practice is that most of the PhD students who have contributed key tools to Ariel and produced world-ranked science papers are being immediately hired, at the end of their doctoral cycle, to permanent positions at institutions outside the UK. While this is a testimony to the quality of their UK doctoral education, the lack of a coherent, structural funding source means the valuable expertise built through the years is being dispersed, and the sizable capital investment the UK has made in building Ariel, as well as a world-leading team, cannot be fully exploited.

- Fragmented and scheduled grant-based funding that does not fit nor adapt to space industry timescales can restrict even sizable, established projects like Ariel from realising their scientific potential in the UK.
- **Building a financial services system designed to meet the unique needs of the space science is vital.** Growth and long-term investment can be supported by a **unified funding approach** involving UKRI, UKSA, and private investors – as described in the recently published report from the House of Lords UK engagement with Space Committee, 'Act Now or Lose Out'.⁶

Opportunities

UK Space has a strong heritage in the UK, and as such UK space science is ripe with opportunities for growth. Particularly, UK leadership in setting regulatory standards and policy for Space could reduce inefficiencies and unlock growth in the sector.

Data Policy

As it did before with heading the creation of a law of the seas, the UK is actively working towards a "globally recognised and competitive regulatory framework."⁷

Ariel is also working towards setting standards of governance for space instrumentation built in partnership among different countries. More specifically, the Ariel Consortium leadership has worked on a **Data and Publication Policy Agreement** to regulate the use of data once the telescope will be launched, which applies equally to all members of the consortium, independent of the country.

In research – particularly in the non-easily accessible space environment – data is key and currency. Creating a data policy is thus a complex challenge not only for the necessity of covering a **wide range of possible scenarios** and finding a set of rules upon which all members have to **agree**, but also thanks to the added difficulty given by the fact that **a comprehensive written data and publication policy has not been the standard** for most space instrumentation built in partnership, which often relies on **‘gentlemen’s agreements’**.

Just as for Ariel, for international space cooperations at large, **homogenous regulation for the space sector is conducive to enhanced efficiency and facilitate cooperation among members**. The UK is one of few countries with an emerging end-to-end offering for space businesses, enabling companies to design, manufacture, launch and operate a satellite under one regulatory regime. Setting new policy standards that would be replicable internationally would allow the UK to be a regulatory leader and to support international space endeavours at the same time.

Data Intensive Emerging Technologies: AI & Machine Learning

It is especially important for policy development to consider AI as a priority, due to the speed of development of data Intensive Emerging Technologies such as AI & Machine Learning and their use in space science.

Government Relations with UK Space Science

Nationally, it is key to **maintain open and collaborative relationships with both established Space partners, as well as new creating new connections where training opportunities exist to facilitate national development through space**. Responsive and open points of contact within the government, particularly now as UKSA enters the Department for Science, Innovation and Technology, are going to be fundamental in the coming age in which the space sector will become increasingly prominent.

Building the Space Economy: A Founder's View from the Frontier



Flow Collingwood
Founder & CEO, Pan Galactic

The United Kingdom stands at the threshold of a new era. Space is no longer only about exploration; it is becoming the backbone of tomorrow's digital economy. Our challenge, and opportunity, is to ensure that this infrastructure is secure, resilient, and sovereign.

At Pan Galactic we are building that foundation: developing quantum-safe, distributed operating systems and blockchain technologies to protect data in orbit and on Earth. But the real story here is bigger than us. It is about how the UK can empower innovation to scale at the speed of the frontier, turning world-class research into globally competitive enterprise.

What's Going Well

There is a great deal to celebrate in the UK's progress so far. The National Space Strategy, the Department for Science, Innovation and Technology's focus on critical technologies, and growing cooperation between government, academia, and industry all signal intent.

Public-private accelerators such as the UKSA Accelerators, ESA BIC, Seraphim Space Accelerator, UKTIN and Innovate UK have nurtured a new generation of companies. This is a great success story. The support ecosystem is strong and has shown real commitment to fostering innovation. Regional clusters, from Space Hub Yorkshire to Cornwall Spaceport, show that world-leading innovation can flourish nationwide.

The people driving these initiatives are exceptional: engineers, researchers, and policy leaders whose dedication and technical skill continue to strengthen the national ecosystem. Companies like ours have benefitted from their encouragement and from the generosity of corporate partners such as KPMG and others who open doors for early-stage ventures.

The UK's scientific base, regulatory clarity, and ethical approach to technology make it a trusted partner globally. These are not small advantages; they are the foundations on which our space economy will be built.

The Funding Challenge — Bridging the Gap Between Aspiration and Access

While the intent is strong, the structures supporting innovation still struggle to match the urgency and scale of opportunity. The problem is not a lack of commitment, but a misalignment of pace and structure with the rhythm of startup life.

A typical national grant competition in space technology can receive more than six hundred applications, with only ten awards made. That ratio illustrates a system designed to give everyone a chance, but one that inevitably spreads impact too thin. Instead of a few transformative breakthroughs, we risk hundreds of partially funded starts, each promising, but none fully resourced to succeed.

Even when companies are successful, lead times between submission, decision, and disbursement can extend to nine months or more. For a startup, nine months can determine survival. Technology, markets, and teams evolve faster than the administrative process that funds them. By the time grants arrive, momentum can be lost.

The structure of many grants compounds the challenge. They often require 50 percent match funding, difficult for early-stage ventures with limited capital. Others operate on reimbursement models, meaning companies must first spend from their own accounts before being repaid later, exposing them to significant cashflow risk. The reporting and compliance requirements, though well-intentioned, can consume weeks of effort in teams that might only have a handful of people.

This complexity naturally favours university spin-outs over independent private startups. Spin-outs benefit from institutional grant offices, research infrastructure, and embedded personnel to handle administration. Private founders, meanwhile, write proposals at midnight after a day spent developing code, managing teams, and pitching investors. The difference is not in talent or innovation but in structural support.

None of this is a criticism of universities, partnerships through Knowledge Transfer Partnerships (KTPs) and other programmes remain essential. But the current system leaves private startups comparatively disadvantaged, even though they are the entities most likely to translate research into revenue, exports, and jobs, by necessity commercially minded and outward-facing.

The solution lies not in reducing oversight, but in redesigning the framework to be faster, more specialised, and more responsive to different applicant types. Funding should recognise that a startup's most valuable asset is time, not paperwork.

Across the Atlantic, agencies such as the US Department of Defense and SpaceWERX demonstrate a model worth learning from. Through the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programmes, the US provides up-front, non-dilutive R&D funding to small companies developing advanced technologies.

This approach contrasts sharply with the UK's reimbursement model. American startups receive the funds they need before they build, enabling rapid prototyping and iteration. The process is highly competitive but agile: companies can progress from feasibility to prototype to procurement within months, not years. The result is a vibrant ecosystem where public missions are delivered through private innovation.

The dividends are clear. The US now leads in commercial space investment, with a deeper investor base, larger domestic market, and a steady flow of new entrants. British founders increasingly look westward, not for prestige, but for pace.

If the UK wishes to remain globally competitive, we must internalise this lesson: velocity matters. Funding should follow performance milestones, reward speed, and focus resources where they can create the greatest multiplier effect. The challenge is not to fund everything, but to fund enough, deeply enough, to make a measurable difference.

Constructive Solutions

There are several practical ways the UK could evolve its innovation model without major structural upheaval:

- 1. Establish a Deep Tech Bridge Fund**
A national co-investment vehicle to fill the gap between small grants and venture capital. It could focus on mission-critical areas like space, quantum, and AI, providing early scale funding that attracts private capital rather than replaces it.
- 2. Introduce Agile Procurement Pathways**
Government and defence customers could adopt "pilot-to-contract" frameworks, where small funded pilots can convert directly into operational contracts if successful. This would shorten procurement cycles and give startups clear routes to revenue.
- 3. Calibrate Grants for Startup Reality**
Create startup-specific funding calls with relaxed match-funding requirements, milestone-based payments, and simplified reporting. Recognise that oversight can coexist with speed.
- 4. Strengthen Regional Innovation Corridors**
Link clusters such as Space Humber, Harwell, and Glasgow into coordinated national programmes. This would prevent duplication, distribute opportunity more evenly, and strengthen supply chains.
- 5. Build Investor Confidence**
Support domain-specific training for investors so that those unfamiliar with space, defence, or quantum can evaluate risk and potential more accurately. A more confident investor base means faster capital flow.

- 6. Rethink How We Invest in Early-Stage Innovation**
It should not take three hundred approaches and nine months of protracted discussions for a founder to close a pre-seed round, yet this is a familiar story across the UK startup landscape. Too often, early-stage founders are asked for Series A-level metrics when they are still proving concept.

By definition, pre-seed investment is designed to prove a concept, not to evidence the scaled outputs expected of later-stage rounds. As the British Business Bank explains, pre-seed capital is "the earliest stage of funding... provided to business owners looking to expand on an initial business idea or concept," and is most often used for "activities such as conducting market research and creating prototypes or Minimum Viable Products (MVPs)." At Series A, the expectations change: as Investopedia notes, investors are looking not just for a great idea but for "a strong strategy for turning that idea into a successful, money-making business."

Recognising this distinction is vital. The purpose of pre-seed is to validate potential, to turn research, technology, or an idea into something demonstrably real, not to deliver revenue or market scale that belongs to later phases. When investors conflate these stages, valuable time and momentum are lost.

For founders at early stages, my commentary above does not absolve we still have our own responsibilities too, we still need to come to the table with viable business ideas capable of making outsized returns for the funding we seek from investors and we need to do what we can to help investment decisions be easy for them to make too.

Between both there is an element of coming together to be done.

We need a faster, more trust-based investment culture, one that deploys capital early enough for founders to seize emerging opportunities. Wider use of SAFE notes and convertible instruments would allow investors to act decisively without the friction of extended due-diligence cycles, while still protecting their position.

From personal experience, the contrast between ecosystems is striking. I was introduced to a US investor at 10 a.m.; by 1 p.m. we had met, and by the end of the conversation they said that if they were going to move forward, they would be committed to a decision within two to three weeks, with the cheque to be wired before the month ended. During that same period, three other US investors acted with similar speed and conviction. This is the pace we need to win.

In the UK, we have the talent, innovation, and intent. If we can match that with the same decisiveness, we will keep our best founders and technologies here rather than watching them migrate to faster-moving markets. Let's get on the same page and start catalysing the skills, passion, and creativity that already exist in abundance across Britain, or face the reality that we may lose them. There's great startups, great talent, great innovation and great investors here in the UK but we need to get on the same page.

7. Foster Talent Retention

Simplify visas for technical founders and high-value engineers. Expand equity-based incentives (SEIS/EIS) to include global talent who choose to build in the UK.

These measures would not require vast new budgets, only focus, agility, and alignment between public and private priorities.

How Pan Galactic is Contributing

At Pan Galactic, we are building the type of company that embodies these principles. Our mission is to secure the data infrastructure of space through quantum-safe encryption, blockchain, and advanced operating systems, all developed here in the UK.

We collaborate closely with universities, clusters, and agencies to combine academic research with commercial execution. Our focus is on creating sovereign capability: technology designed, built, and governed within the UK but deployable worldwide. In the long term, what we are building will serve as the underlying architecture for a new space economy, one where software can create value quickly and securely. We aim to be a facilitator and enabler of the emerging space data economy.

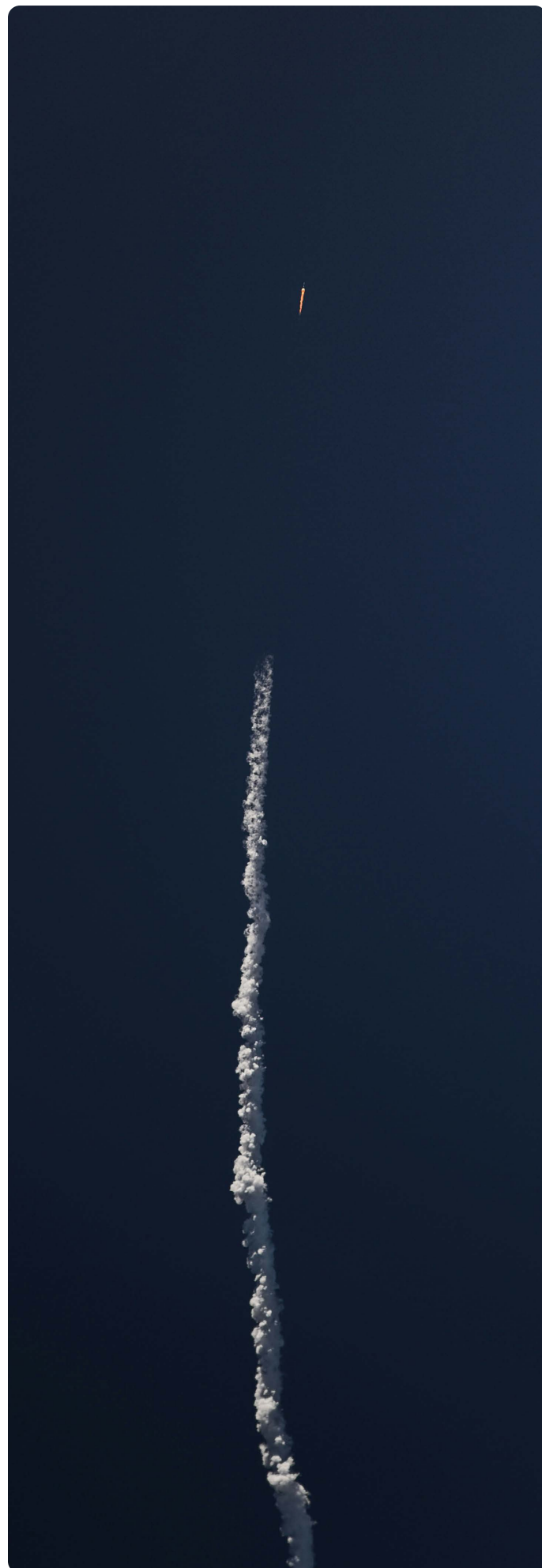
We see our role not just as builders of technology but as contributors to the national dialogue on how the UK can lead in the next digital epoch. By working in partnership with government, industry, and academia, we aim to demonstrate that British innovation can be both principled and globally competitive.

Closing: A Vision for the Future

The United Kingdom has everything it needs to lead: talent, vision, credibility, and creativity. What we must now unlock is velocity, the ability to move ideas from concept to impact at the speed the modern world and its markets demand.

Space will define the next century of economic and technological growth. If we align our policies, funding systems, and partnerships accordingly, the UK can become the nation that builds the infrastructure of that future, secure, sovereign, and scalable.

This is within our reach. We simply need to move faster, together, and ensure that the resources flow to those with the capability to turn innovation into commercial traction and strategic advantage which matches our ambition.



People in the Loop: Human Factors in the Space Race



Barry Kirby

Managing Director of KSharp

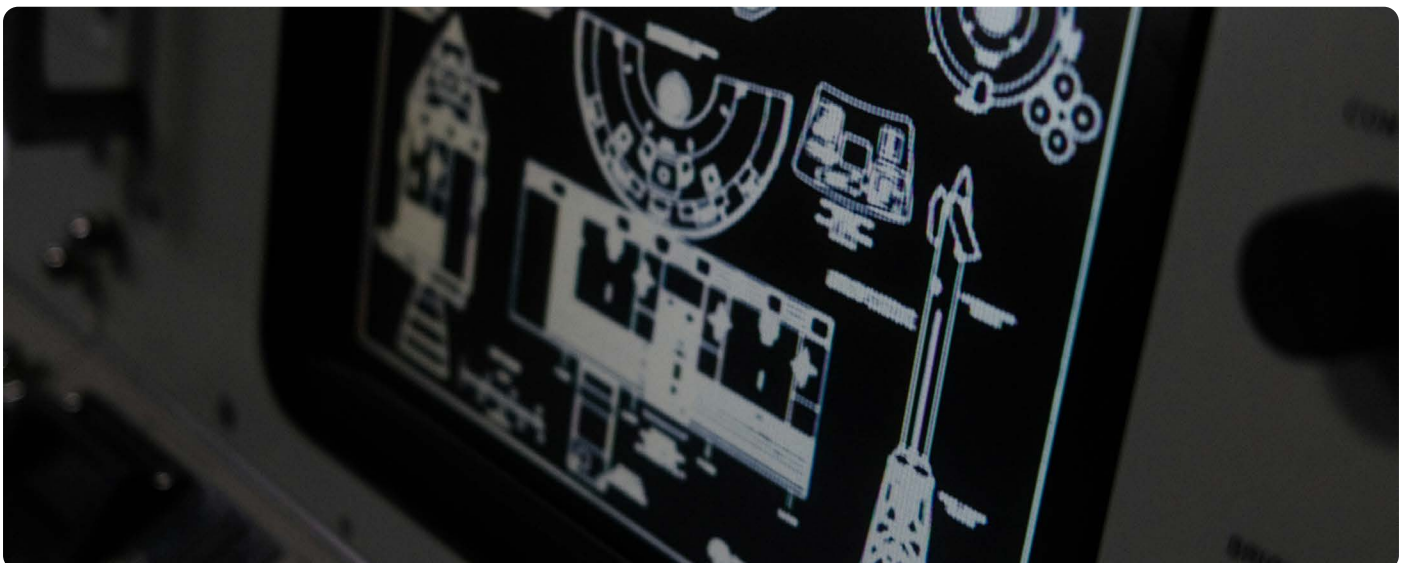
The UK has a huge ambition to be part of the modern space race, and we have to recognise that we have been part of the space scene for a good number of years with satellite communications and other satellites, as well as having two astronauts actually getting placed in crews. Both Helen Sharman and Tim Peake are probably our most famous people, but we hope to see this grow. This is probably what most people think about when they think of people in the space sector, those going to the ISS or generally being “in space” but the reality is all our space operations have a huge number of people involved and they all need to be considered to ensure they can carry out their tasks as effectively as possible.

This probably sounds like a really obvious statement, but quite simply we are not doing it. We are unintentionally developing a lot of bespoke systems, a lot of new bespoke procedures and capabilities because we are pushing strongly the innovators, literally those who are creating new satellites from their garages and becoming sector leaders, ploughing their own furrow, and being celebrated for their fantastic achievements. And quite rightly so but imagine how much more success they could have had if we had given them better handrails to use.

It is often said that many projects fail because of user error and operator error, but fundamentally a lot of these come about because of not enough consideration of

the human in the loop at the design and development phase of the project, the human is expected to “learn” how to do many things in order to operate a system, rather than design it well, and then we get frustrated when they fail to do so at critical points and incidents happen, systems break and in the worst cases, people get hurt or die. This is what is happening in the space sector, because it is shiny and new, we have not implemented standardisation in the design of interfaces, we are not actively sharing best practice and we are not properly considering the Humans in the loop, we are treating them more as an inconvenience and something that has to be dealt with.

However, as a nation or even a discipline, we are not learning from what has gone before. The UK has a strong history within aerospace and defence of learning how putting users at the centre of its projects, that it yields safer and more effective systems, which are easier to operate and maintain. In safety critical disciplines (Aerospace, Defence, Nuclear, Oil and Gas, etc) there are mandates and policies to ensure the humans within the system are considered and engaged with as a critical part of the system. It's easy to think that there is no need to put people first in the space industry because in the UK we don't have a pressing need to put astronauts into space from UK launch sites, and those are the only people really involved who need special space attention. However, that could not be further from the truth, we have a substantial number of people involved with



our space sector operations, Space Craft Controllers, Maintainers, Flight Planning and Dynamics, Space Port Managers, staff,

The space sector in the UK is still in an early period of development – there are some amazing projects and systems, but it is so niche that the knowledge and skills, in comparison to other sectors, is wafer thin, key capabilities reside in a small number of individuals. It is therefore crazy to think that in the space sector we are beginning from nothing and learning those lessons again. The same is not true in the systems, software, and hardware engineering elements, in those domains, we are building on best practice and the latest materials and technologies. Our approach to the user is back to first base. I would like to say that this is only true of those small energetic and innovative companies who are bounding forward on a wave of enthusiasm, but it's not, our larger companies too treat the user as an afterthought and somewhat begrudging.

There is no need for it to be this way, there is a wealth of best practice to fall upon and there is more that the UK Government could do to drive this best practice in. True innovation is the transfer of knowledge from one domain to another, and we have a lot of domain knowledge to transfer but we are not learning from the most critical resource we have.

At a basic level, a lot of Satellite control stations are created from scratch, maybe with an eye to an applicable ISO standard, but that is not mandated. We could mandate standards in our industry for usability (ISO 9241), we could go one step further and develop a common style guide for user interfaces, which means that every system would have a common set of building blocks to develop from. This has a huge knock-on effect that the training time for Spacecraft Operators would decrease dramatically, especially when moving between systems, meaning that overall operating costs would go down.

We could go one step further and lean on the way the UK Defence Industry has a User Centred approach to system acquisition, mandated through JSP 912 – Human Factors Integration for Defence Systems which drives a mandate to consider the user as a key component of the system and to integrate them with the system, not just consider them an add on. This is supported by a Defence Standard (Def Stan 00-251) which gives a lot of applicable process and underpinning that are technical guides which any supplier and developer has access to but are strongly encouraged to utilise. These are kept in review by both the MOD and industry to ensure they represent best practice. There is no reason the UK space sector should not do what other sectors have done and create a version of their own based on the defence example and create their own guidance that can be shared and used as a fundamental building block. This would create more usable systems and save so much time and money in the design and development phases of systems.

The UK already has so many hurdles to overcome as we reach for the stars, congested flight paths, funding, and a comparatively immature sector – we cannot afford to waste time, money, and effort in relearning the lessons that we have already learned. Our space sector exists to support people doing everyday things, be that communicating, manufacturing, monitoring, etc, it's crazy that we shroud the usability of these systems in "rocket science" where we could lead the world in the usability of space systems, for operators, maintainers and end users.



Power from the Stars: Britain's Industrial Opportunity in Space



Sam Adlen
Co-CEO,
SpaceSolar

Over the last decade, the space industry has undergone a profound transformation to the point it is now critical in providing the intelligence needed to manage our lives, businesses, and planet in ways needed in the 21st century, along with connectivity everywhere, and a clear recognition of its importance for defence and national security. However, a step change is coming in launch costs and increasing capacity, through a new generation of reusable heavy-lift vehicles such as SpaceX's Starship, Blue Origin and others. This is enabling a paradigm shift: the transition from monolithic satellites to the construction of large-scale, economically transformational infrastructure in space.

This revolution marks the dawn of an in-orbit economy, a new frontier for industrial and economic activity that will underpin the next century of growth. It will be characterised by large, modular structures assembled robotically in orbit, sustained by AI and autonomous operations, and delivering services that directly address some of the biggest challenges we have on Earth.

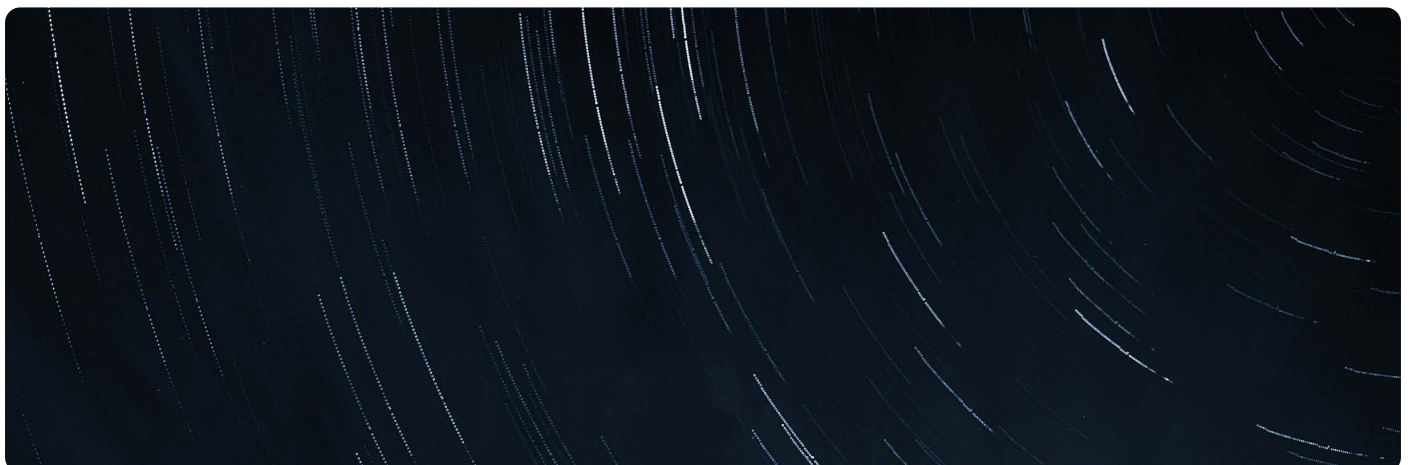
The UK is exceptionally well positioned to lead this revolution. The UK's strengths span the entire value chain. We are global leaders in in-orbit servicing and manufacturing (IOSM), and two of the leading space sustainability and logistics companies have strong presence in the UK (Astroscale and Clearspace). Our regulatory frameworks and insurance markets are world-class, and our ecosystem combines agile start-ups with major primes and world-renowned research institutions, creating the ideal environment for innovation, appropriate risk-taking, rapid delivery, and with the right support the scale of impact.

From space-based manufacturing and in-orbit servicing to new communications architectures and data infrastructure, UK companies are already defining the next wave of space capability. The following would all be considered global category leaders or thereabouts:

- **Space Solar:** commercialising space-based solar power (SBSP), the ultimate clean energy technology, delivering continuous, affordable energy from space to markets on Earth.
- **Space Forge:** pioneering in-space manufacturing of advanced materials and semiconductors.
- **BioOrbit:** developing new pharmaceuticals in microgravity.
- **Axiom:** set-up presence in the UK to deliver in-orbit datacentres.
- **Astroscale, OrbitFab, and Magdrive:** establishing the foundations of a circular, service-oriented space economy.

This new era of capability will unlock a portfolio of multi-billion-pound markets, from space-based solar power (£1 trillion+ potential) and space data centres (£1 trillion+ potential) to direct-to-mobile communications (£100 billion) and microgravity materials and pharmaceuticals.

As an example, Space Solar's satellites harvest abundant solar energy in space and beam it wirelessly to Earth, day and night and in all weather. Independent



studies confirm that SBSP will significantly reduce the overall cost of energy systems. It is safe, secure and scalable, with a carbon footprint half that of terrestrial solar and projected costs as low as \$10/MWh, making it potentially the cheapest power source on the planet. Like the revolution in communications, the future of power is wireless and global technology leaders like Google, Jeff Bezos and Elon Musk are now clear that harnessing the energy of the sun in space is key for the future power needs of humanity.

Independent studies show the scale of benefit. Research by Imperial College London demonstrated that introducing every 2 GW of SBSP into the UK energy system could yield around £1 billion in annual cost savings while cutting the cost of achieving Net Zero and achieving energy security and economic growth through instantaneous export.

The UK has world-class expertise across all the enabling disciplines for SBSP including photonics, radio frequency systems, power electronics, and wireless power transmission, to robotics, in-orbit manufacturing, and AI. It also has a strong innovation environment, a forward-thinking financial sector, and world-leading space regulation that can enable this opportunity to scale rapidly.

The Space Energy Initiative (SEI) brings together over 90 entities from the energy and space industries, academia, and government forming a powerful coalition to deliver strong domestic supply chains and international leadership. SBSP is a no regrets move, creating high value jobs and future industries in terrestrial wireless power transmission and in-space assembly on the journey.

Beyond its direct economic impact, SBSP offers broader national benefits: UK leadership in clean energy technology, the delivery of the National Space objectives, international partnerships, and the creation of high-value regional jobs. With companies such as Space Solar at the forefront, the UK has a unique opportunity to lead the next great transformation harnessing space to power a clean, prosperous future on Earth and for the UK.

These businesses are not without risk but the opportunities are enormous, the spillover benefits are high, they are being shaped now, the barriers to future entry will be high and the strategic importance of space cannot be underestimated – “the ultimate high ground” and “the equivalent of the waterways”. As an island nation, with limited factors of production, the long run potential is vast from power to resources and aligns perfectly with a bold, ambitious Britain aiming to deliver a bright future for citizens and the planet.

The UK space sector stands on the threshold of extraordinary opportunity, but several structural and policy barriers are constraining its ability to attract global capital, scale, and secure leadership in the emerging in-orbit economy.

1. A short-term policy focus at the expense of strategic vision

While the UK has made significant progress in supporting existing space markets, including excellent work in bringing together civil and defence requirements, funding constraints have meant much of the focus remains on today's challenges rather than the transformative opportunities of the next decade. Areas such as SBSP, in-orbit assembly and manufacturing, and orbital data infrastructure are huge opportunities that will transform capital flows into the sector and drive huge economic growth. Without a shift toward long-term industrial strategy and targeted investment in “next-generation space,” the UK risks ceding leadership in these trillion-dollar markets and the barriers to entry will be high if the UK is not in the vanguard. One of the long-running criticisms of the UK is that we are great innovators but do not follow through and scale the businesses. UK innovators, and the early-stage support from government, have set those conditions again and the stakes are high for ensuring a different outcome.

2. Gaps in regulatory frameworks for next-generation activities

The UK's regulatory and insurance ecosystem is among the best in the world, but frameworks for close-proximity operations, in-orbit assembly, and wireless power transmission from space are still emerging. Regulators have been brilliant and developing proportionate, enabling regulation would allow UK industry to lead responsibly while shaping international norms. Early clarity on licensing for SBSP and related technologies would significantly boost investor confidence.

3. A missing layer: scaling UK ‘Tier One’ space businesses

Current innovation policy across many sectors has been effective at supporting R&D across the supply chain, but it rarely helps companies grow into globally scaled, tier 1 businesses that can crowd in public and private finance and ultimately channel funding toward UK supply chains. There is a group of leading international space and defence primes that have good UK presence and will remain strong for defence and sovereign security capability but the growing economic opportunity is not their priority and without significant reshaping they are unlikely to be the scale commercial vehicles for these opportunities. Equally, many in the supply chain are international players. This has some benefits but not enabling the next generation of UK Tier 1 businesses has limited the UK's ability to capture value from its innovations and leads to a sector highly dependent on government support and with limited ability to scale. To compete internationally, the UK must focus on building large-scale businesses capable of anchoring UK and global supply chains, crowding in private finance, and channelling growth into UK manufacturing and services.

4. **Lack of coordination, promotion, and delivery across government**

Space delivers for energy, defence, communications, health, agriculture, innovation, industrial strategy and much more. Space budgets are tiny compared with the opportunity ahead and cross-departmental reach and authority is needed to align non-space investment and regulation across DSIT, DESNZ, DEFRA, MOD and others.

5. **Insufficient recognition of the importance of new, scalable low-carbon baseload energy**

The UK's clean energy strategy has focused on terrestrial renewables and nuclear, with limited attention to fast developing options such as SBSP. More than ever, energy is central to competitive advantage across AI and everything else. By mass producing the equivalent of mobile phone electronics and putting it in space, SBSP deliver tens of Gigawatts each year (Elon Musk talks of capacity to launch 100s of GW each year for orbital datacentres). Greater engagement from DESNZ and the Treasury could unlock major energy cost reductions and new export industries in high-value services and technologies.

6. **Workforce transition and capability growth**

There are brilliant people in the UK's 50,000-strong space workforce but as many existing businesses struggle following the success of Starlink, a period of reinvention is needed. In many ways the timing is ideal with the step change dislocation we are seeing in the sector but the transition from satellite services to large-scale orbital infrastructure will require new skills in robotics, AI, and manufacturing in space. With targeted reskilling and creation of the next generation of Tier 1 businesses, the UK can leverage the excellent skills base to create a space sector that can drive major growth for the UK.

To capture the immense potential of the next space economy, government and industry must work together to create the conditions for intelligent risk-sharing, long-term commitment, strategic partnership and sustainable growth:

1. **Restore cross-government coordination and leadership**

Reinvigorating mechanisms such as the National Space Council would ensure strategic alignment across departments and link space policy to the UK's broader goals for growth, energy security, and national security. A dedicated Minister for Space would provide visible leadership and accountability, ensuring momentum is maintained across political cycles. Currently, space is funded through limited space budgets yet the infrastructure that is being created drives benefits across a range of other departments. Sadly, presently the UK is failing off the back of the boat from an initial leadership position in space financing as other nations increase investment by orders of magnitude in recognition of the opportunity.

2. **Develop and support flagship UK-led prime businesses**

The UK needs to prioritise scaling and developing Tier One businesses like Space Solar, Space Forge, BioOrbit and the next generation of UK unicorns and

decacorns with huge terrestrial markets, as national industrial champions. Importantly, this provides vehicles beyond government funded R&D to both anchor and benefit from the great ecosystem of international supply chain companies in the UK. Options could include::

- Coordinated support including, procurement, R&D alignment, international partnership and export support, and financing across departments to ensure continuity from prototype to deployment. Presently there is no single point of coordination. We need to be "less British", pick winners, champion their success and recognise that not all will succeed but the spillover benefits of ambitious innovation will be huge.
- Government as anchor customer for space-derived power and other orbital infrastructure services e.g. Contracts for Difference for SBSP and equivalent conditional purchase agreements for other areas. Providing conditional commitments is no cost to government but can be very powerful as a signal that can leverage private capital.

This approach will anchor IP, investment, and high-value jobs in the UK, creating new export industries.

3. **Unlock private capital through innovative public-private finance models**

Many of the growing space opportunities are infrastructure businesses. Government can catalyse investment by de-risking early-stage infrastructure financing. The developments with the mansion house accords are a good start in terms of potential to channel private capital toward the next generation of UK growth businesses. The UK is strong on financial innovation and other options could include:

- Space Infrastructure Bonds, offering long-term investment vehicles for institutional investors.
- A structured "Fund of Funds for Space", blending public capital with private finance to provide a pathway to scale high-growth UK companies.
- Targeted risk guarantees or insurance backstops for large-scale first of a kind projects such as SBSP, enabling confident private participation.

These mechanisms would signal strategic intent and attract major global investment into the UK's space and clean energy sectors.

4. **Invest in people and skills for the in-orbit economy**

A Space Skills for the Future programme could equip engineers, technicians, and data scientists with the expertise needed for robotics, AI, and sustainable space operations. This would secure the long-term workforce pipeline and help redeploy existing talent into emerging high-growth areas and businesses.

2. Establish a UK Low-Earth Orbit Development and Manufacturing Cluster

Building on UK leadership in IOSM, a dedicated in-orbit development and manufacturing cluster in space could be created to industrialise close-proximity operations, robotic assembly, and cooperative space infrastructure. This would:

- Shift the space sector paradigm from “launching to avoid” to “launching to cooperate”, unlocking the economic transformation equivalent of humans transitioning from fields to towns.
- Position the UK as a global leader in sustainable space logistics.
- Develop world-class expertise and new norms for safe, responsible orbital operations.

The UK has the opportunity to lead a new industrial revolution, one where space infrastructure directly delivers prosperity, sustainability, and security on Earth. The enabling technologies are ready, the companies are developing, and the economic potential is vast. By combining bold vision with smart partnership and blending public sector leadership with private innovation, the UK can accelerate the transition to an in-orbit economy, deliver affordable clean energy from space, and secure long-term competitive advantage and a future of possibility and abundance for generations to come.



A Strategic Approach to National Space and Quantum Advantage



Dr. Kieran Bjergstrom
Director, Quantum
Technologies Associates

The UK space sector has become one of the country's most productive and innovation-intensive industries. Recent analysis puts total space-sector income at around £18.6 billion with over 55,000 direct employees, and shows that it underpins everyday services from weather and climate monitoring to navigation, logistics and secure communications, while anchoring high-value jobs in clusters across the UK. As launch capabilities, small satellites and downstream data services mature, competition is intensifying; nations are not just striving to participate in space, but to differentiate themselves in the quality and capability of the services they deliver from orbit.

Similarly, quantum technologies are an area of strategic focus and investment for the UK, and we may find significant capability enhancements and economic opportunities in the overlap of these sectors. Quantum could serve to make UK space systems markedly more precise and trusted while they are operating, enhancing and synergising with current solutions, as well as creating pathways to novel and disruptive solutions.

The central question is therefore not whether quantum belongs in space, but how the UK can turn its existing strengths in quantum and space into internationally competitive products, platforms and services. That means focusing on technologies that can be engineered, qualified and operated as part of real missions, so that the joint development of quantum and space becomes a driver of export, investment, high-wage employment and civil security.

Where quantum and space meet

Quantum technologies intersect with space in four main domains. Each has real potential, and each carries demanding engineering and qualification challenges that must be confronted early.

Quantum time and navigation

Advanced atomic and optical clocks, whether in orbit or on the ground, can sharpen the timing backbone on which satellite navigation, secure communications and financial networks rely. Paired with quantum inertial sensors – cold-atom accelerometers and gyroscopes – they can support navigation and attitude control when radio-frequency signals are weak, jammed or simply unavailable, for example in cislunar space. Realising this requires clocks and inertial systems that are compact,

power-efficient, thermally stable and radiation-tolerant over long mission lifetimes, and that integrate cleanly into existing navigation and timing architectures. The UK already has recognised strengths in cold-atom sensing and advanced optical clocks, giving it a realistic prospect of contributing meaningfully to these missions.

Quantum sensing from orbit

Quantum-enhanced sensors promise new modes of observing the Earth and its environment. Gravity and gravity-gradient sensing, for example, can reveal changes in ice, groundwater and mass distribution that are invisible to conventional instruments, with direct relevance for climate resilience, infrastructure planning and resource management. There are mature gravity missions, but quantum sensors may increase sensor stability enabling, change detection for continuous monitoring, and overall increased performance. Other approaches, such as highly sensitive magnetometry or emerging quantum RF sensing concepts, could contribute to space weather monitoring and elements of space domain awareness. Here, the trade-offs between sensitivity, robustness, calibration and coverage become central: exquisite instruments that cannot be operated reliably from orbit will not generate lasting value.

Quantum communications and time transfer

Quantum techniques in space communications are often framed solely around quantum key distribution. In practice, the more immediate opportunity may be in combining secure distribution of keys with ultra-precise transfer of time between ground and space assets. Optical links that exploit quantum effects can, in principle, support tighter synchronisation across constellations and between terrestrial infrastructure and satellites, reinforcing both navigation and secure networking. The challenges are familiar to anyone working on optical space links: pointing, acquisition and tracking, atmospheric effects for ground segments, and the need to interoperate cleanly with classical communications and emerging post-quantum cryptography.

Quantum computing and optimisation for space

Quantum computing is at an earlier stage, but it is still relevant to the space sector. There appears to be prospective value across several algorithm families – from optimisation and scheduling through to simulation and certain machine-learning tasks – for both ground and space segments. In the medium term, the most likely pattern is that noisy intermediate-scale quantum (NISQ) machines and quantum-enhanced algorithms are used on the ground to support constellation design, tasking, data fusion and mission planning, complementing advanced classical methods rather than replacing them outright. Realising quantum computing in orbit, as a form of edge compute for demanding on-board processing, would be technically challenging but could in time offer a distinctive avenue for value where latency or data volume makes purely ground-based processing insufficient.

Near term enabler, long term foundation

Viewed together, these domains suggest a sequence. In the near term, quantum is primarily an enabler for the space sector: it allows us to deliver more precise, resilient or informative services from orbits and platforms that are already in demand. Over the longer term, some of the most disruptive quantum capabilities – such as truly global entanglement distribution, worldwide quantum networks or ultra-stable timing grids – may only be achievable because of space infrastructure. In that second phase, space becomes the foundational domain that enables quantum technology, rather than the other way round. The UK will only reach that point, however, if it first succeeds in qualifying and flying quantum systems that address current space-driven demand.

Prosperity, security and space as a warfighting domain

Space has always had a strategic dimension. Early navigation and observation satellites were military projects, reflecting the role of space as an arena for deterrence, intelligence and signalling between major powers. What has changed over recent decades is not that space has suddenly acquired military relevance, but that its criticality and vulnerability are now widely recognised across the whole economy.

Modern armed forces still rely on satellites for communications, intelligence, missile warning and precision navigation. Civil society, in turn, relies on the same or closely related systems for aviation, shipping, emergency services, energy and finance. Space infrastructure has become a form of critical sovereign infrastructure, even if it sits in orbit rather than on national territory. Systems launched into space are rarely purely civilian or purely military in the way older categories suggest: the same constellation can support commercial services in peacetime and contribute to security or defence objectives in times of need.

Quantum-enabled space capabilities sit squarely within this mixed picture. They can sharpen climate and environmental monitoring, improve the efficiency and robustness of logistics and infrastructure, and at the same time strengthen the timing, sensing and

communications functions that underpin deterrence and defence. The opportunity is to think beyond simple “dual-use” labels at the level of individual components, towards genuinely multi-use infrastructure and services: systems designed from the outset to deliver value across commercial, civil and security domains, and to be re-tasked or prioritised as circumstances demand. In that context, quantum in space is not a niche embellishment, but a potential contributor to the resilience and effectiveness of the UK’s wider critical infrastructure.

A pragmatic perspective on quantum for space

From a strategic and technical standpoint, a few observations help to cut through the noise around quantum in space.

Firstly, it is more productive to start from missions than from mechanisms. The right question is not “where can we put quantum on a satellite?”, but “where does quantum materially change outcomes or economics for missions the UK already prioritises?”. Those missions include commercial services and scientific objectives. Scientific missions, in particular, can act as long-term technology paths: they justify sustained investment in the packaging, qualification and operation of quantum payloads that may later underpin commercial services. Both quantum and space are capital-intensive domains, and short-term capital is often poorly matched to their development timescales.

Secondly, different quantum domains sit on different time horizons. Clocks and inertial systems appear nearer to deployment for some navigation and timing roles. Quantum sensing has clear pull from climate, infrastructure and resource-monitoring applications, provided instruments can be engineered and operated reliably in orbit. Quantum communications, by contrast, is already being demonstrated in space, with missions such as Micius and forthcoming UK-linked satellites like SPEQTRE and SPOQC showing that space-based QKD and related optical links are a genuinely near-term prospect rather than a distant ambition. Quantum computing is different again: the more likely pattern in the medium term is quantum-enhanced algorithms running on ground-based NISQ machines to support design, scheduling and data exploitation for space missions, with true quantum edge compute in orbit remaining an ambitious, longer-term prospect that will depend on both hardware maturation and a strong case that processing cannot feasibly be done on the ground.

Thirdly, the hard problems are engineering and integration. Making quantum systems space-ready requires progress in packaging, power, thermal management, radiation tolerance and long-term stability, combined with credible pathways to integrate them into constellations, ground segments and service offerings. The UK’s advantage will be determined less by isolated laboratory demonstrations of quantum phenomena than by whether it can field complete, dependable systems that customers are willing to pay for.

Policy directions: missions, enablers and exploratory bets

If quantum in space is to support UK prosperity, security and international influence, it needs coordination and focus. Four priorities stand out.

A mission for quantum in space

Define, within the national quantum strategy or as a cross-cutting UK mission, a clear set of outcomes for quantum in space, such as operational UK-built quantum payloads, exportable services, and embedded capability in regional clusters, and use these as guide rails for public investment.

Invest in the space-qualification pipeline

Back shared facilities and programmes for environmental testing, radiation-hard design, SWaP-optimised packaging and calibration, so that quantum payloads can move efficiently from laboratory prototypes to flight-ready systems without each organisation recreating the same expensive infrastructure.

Use procurement to create the first markets

Shape public procurements and demonstration missions so that successful quantum clocks, sensors and communications or time-transfer payloads can transition into paid services for climate, timing, connectivity or space domain awareness, with an explicit expectation of multi-use value. This implies planning and governing space infrastructure increasingly as multi-use critical infrastructure, rather than as separate civil and defence silos.

Back the enabling supply chain and skills

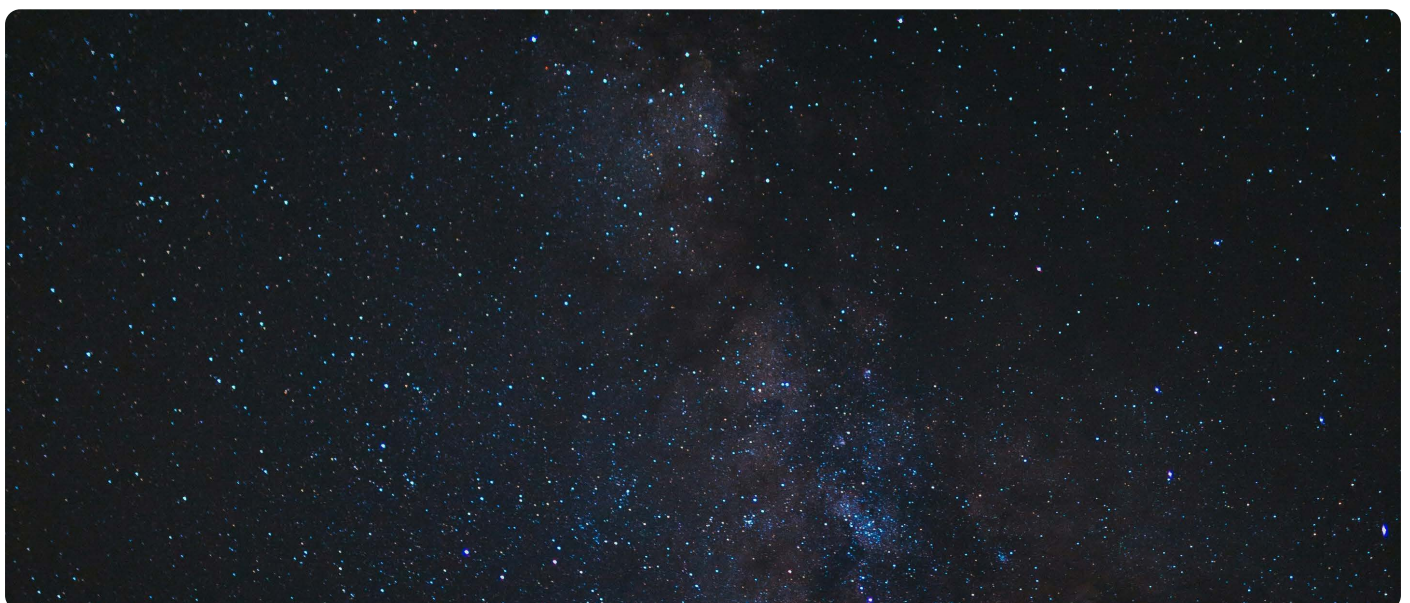
Support the enabling layers, such as lasers and photonics, vacuum and cryogenic systems, control electronics, modelling and software, and invest in skills programmes that bridge quantum science and space engineering, so that UK companies can design, build and operate quantum-enabled space systems at scale.

Quantum in space as a proving ground for UK capability

The UK's ambitions for science, climate leadership, digital infrastructure and national security all converge in orbit. The space sector already contributes billions in income, supports tens of thousands of high-productivity jobs, and delivers services that touch almost every part of the economy. Quantum technologies offer a way to deepen and differentiate that contribution, making UK space services more precise, more trusted and more valuable to international partners and customers.

Realising that opportunity will not be automatic. It will require sober choices about where quantum genuinely improves space missions, sustained investment in the space-qualification pipeline, and a deliberate focus on complete systems rather than isolated components. It will also require an appreciation of the evolving relationship between the quantum and space sectors: in the near term, quantum will help space do more with the assets it already has; in the longer term, space may become the essential platform that enables new quantum capabilities which cannot be realised any other way.

If the UK gets this right, the space-quantum overlap could provide scalable and enduring value creation, anchored in UK organisations, skills and exports. That, ultimately, is the promise of quantum in space: not abstract R&D, but a concrete contribution to prosperity, resilience and international standing.



Mission Control: A Strategy for Britain's Space Economy



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The contributions in this paper make clear that the United Kingdom possesses both the capability and the ambition to play a defining role in the global space economy. What is lacking is not potential but coherence: a national framework that aligns industrial policy, public investment and procurement, regulation, and skills under a single strategic purpose.

The UK's comparative strengths: engineering excellence, financial sophistication, academic leadership, and a culture of innovation, provide a strong foundation on which to build. Yet these advantages are currently diluted by fragmented governance, inconsistent procurement, and a funding model that struggles to match the pace and scale required by frontier technologies. A unified mission-driven approach, supported by clear leadership within government, is essential to unlock the sector's full potential.

To succeed, policy must combine long-term investment with agility. The state must act as a catalyst by co-investing to de-risk innovation, aggregating demand through procurement, and ensuring that the benefits of space investment flow across the whole of the United Kingdom. The private sector, for its part, must respond with the same urgency and confidence that characterise the most dynamic global markets.

Space is a critical component of our national defence and security – and resilience. We must maintain a single-minded focus on securing our sovereign infrastructure and technical expertise, using all policy tools at the disposal of the state.

As contributors to this paper have emphasised, the task ahead is not only to build satellites or the means of getting them into space, but to establish the infrastructure of a modern digital economy, unencumbered by bureaucratic hurdles. Space is the connective tissue linking climate science, communications, security, and data. The technologies and institutions we establish now will define Britain's competitiveness, resilience, and global standing for decades to come.

Sean Woodcock MP correctly identified the broader supporting infrastructure as a weak point in our national ambition. If we want to maintain our technological edge against superpower rivals, we need to retain and attract the best talent, which means making the UK an attractive place to work, to start a business and to

conduct world-leading research. This requires a long-term approach to spending and infrastructure decisions, including in planning.

A renewed national strategy should be guided by three principles:

1. **Integration:** aligning civil, defence, and commercial activity under a single framework focused on the national interest.
2. **Investment:** using public capital to crowd in private finance, build capability, and scale innovation onshore.
3. **Shared Prosperity:** ensuring that space contributes to regional growth and exports, and high-quality employment, across the United Kingdom.

With clear direction, stable governance, and a focus on delivery, the UK can consolidate its place as a global leader in space finance, engineering, and data services, building on its strong historic position in telecommunications manufacturing and services. The opportunity is substantial, but time is running out. If Britain is to secure its rightful national role as technological and industrial leaders, it must act with confidence, pace and a singular focus on the national interest. Space will not wait for us, nor will the United States or China. The challenge now is to match our ambition with execution, translating vision into delivery and ensuring that Britain's space economy serves national prosperity and sovereignty.

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REACH OR RETREAT

BRITAIN MUST MAKE THE CHOICE TO BE A SPACE FARING NATION

