Role and Impact of Academia on the UK Space Sector

Summary Report

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to understand clearly and with certainty

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Executive Summary

The UK space research landscape and its funding

UK space academic research is broad and diverse, with researchers active **across the entire value chain** spanning from technology development to space-related ethics and law.

There are **112** active **UK space research organisations**

There are over **5,200** active **UK space researchers**

UK space research receives **£260m+** in **competitively awarded funding** per year

There are **active space researchers in every region and devolved administration of the UK**, with particularly high numbers of organisations in London, Scotland and the South East. Space researchers are distributed more evenly across the UK than the wider space sector, with notable clusters of researchers in Scotland and the North East, especially on a population weighted basis. Over three quarters of space research organisations host Earth Observation research, while two thirds are active in space science and technology. London is notable for its concentration of policy-adjacent research, including space law, economics and philosophy, while space science and data analysis is spread across the UK.

As measured by the number of active space researchers, Oxford University hosts the largest space research community, and 3 of the top 10 largest space research organisations are in Scotland. Our researcher estimates exceed prior studies, reflecting scope differences, additional research depth, and likely real growth in activity in recent years.

While not comprehensive, we identify **over £260m of competitively awarded funding that flows annually** to the UK space research base. We identify a total of £633m awarded to active, space-related UKRI projects. The UK Space Agency is another key funder of space research, with internal Agency analysis estimating that of c. £1.6bn funding from the last five years (2021-25), around 25% of the UK Space Agency's total annual funding flowed to the UK research base, through both contributions to ESA and National programmes. Since rejoining Horizon Europe, we identify £23m in space-related grants to UK space research - around £6m per year. Other sources include MoD, ARIA, and private funding.

The impact of UK space research

Academic impact covers **scientific discovery, policy influence, skills development, innovation, national capability, and international competitiveness**. This provides a crucial engine for space sector growth, capability development, and spillovers.

The UK ranks 2nd globally within the top 10% of most cited publications in astronomy and space research (2000-2020), and academia has long-standing heritage in mission design and operations. Sustained academic research builds **global competitiveness** over decades. These capabilities can translate into leadership roles in global consortia, such as the 37 UK Principal Investigator (PI) or Co-PI roles across ESA missions since 1975.

Space research also leads to real-world impacts on **economic growth, productivity, and welfare**, including through spinout company creation. Academia often anchors regional innovation systems, helping companies to validate technologies, attract capital, skills and investment, and build end-to-end supply chains. Of the ~55,000 employed in the UK space sector, around 2/3 are university educated (the highest proportion of any UK sector). Academia maintains and shapes this skills pipeline through courses and targeted initiatives.

UK research shapes governance of space and underpins space-derived evidence used to inform global climate policy on Earth. Military equipment that depends on space assets constitutes critical national infrastructure, and UK academia plays a core role in **developing and protecting this infrastructure**. While not comprehensive, we present case studies and examples highlighting the foundational impact of academia on the UK space sector, wider economy, and society. However, sustained **long-term funding** and expansion of university-level **commercialisation support** are key to realising the future impact of space research.

1. Introduction

1.1 Context

The UK's academic space research community operates in a policy environment defined by the *2021 National Space Strategy*, as well as recent publications such as the *Modern Industrial Strategy* and *2024 Space Industrial Plan*. Together, these frameworks collectively highlight the role of research, innovation, and skills in driving sector growth, strengthening national capabilities, and securing the UK's position as a leading space nation. An updated space strategy is expected in Spring 2026, reinforcing the timeliness of this study's findings.

Government, industry, and academia are increasingly expected to work in partnership, with universities and other research organisations recognised as core to mission and programme development, technological advancement, workforce supply, and technology transfer. Despite this central role, there remains **limited systematic evidence on the scale and impact of the UK's space research base**. This study therefore aims to provide timely insight into how *academic* (shorthand for universities and related research organisations) capabilities underpin national ambitions in space and deliver wider socioeconomic impact.

Evidence from this study will support government, industry, and wider stakeholders to better understand how the space research base contributes to meeting UK ambitions within and beyond space. This could inform targeted support through policy interventions, funding support, and collaboration to maximise these contributions.

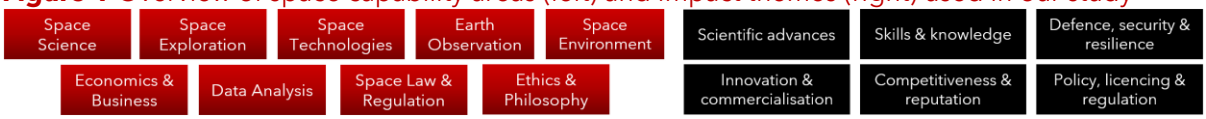
1.2 Objectives & scope

1. To map the **size and nature** of the UK's space academic research base
2. To illustrate **sources and magnitude of funding** available to the sector
3. To present the **impact** the community has on the UK space sector and beyond

Overview of methodology

This study uses a broad definition of space research activity, including the following nine capability areas,[ii] and investigates a range of impacts across six themes:

Figure 1 Overview of space capability areas (left) and impact themes (right) used in our study



We mapped the UK space research landscape using **AI-assisted web-scraping** to generate initial results, which were verified using **manual validation**. Funding mapping was conducted through **desk-based research** of key databases (e.g. UKRI Gateway to Research and the Horizon Europe CORDIS portal), alongside data provided by the UK Space Agency. For the impact assessment, we used desk-based research and interview insights to inform key performance indicators, case studies, and non-indicator insights.

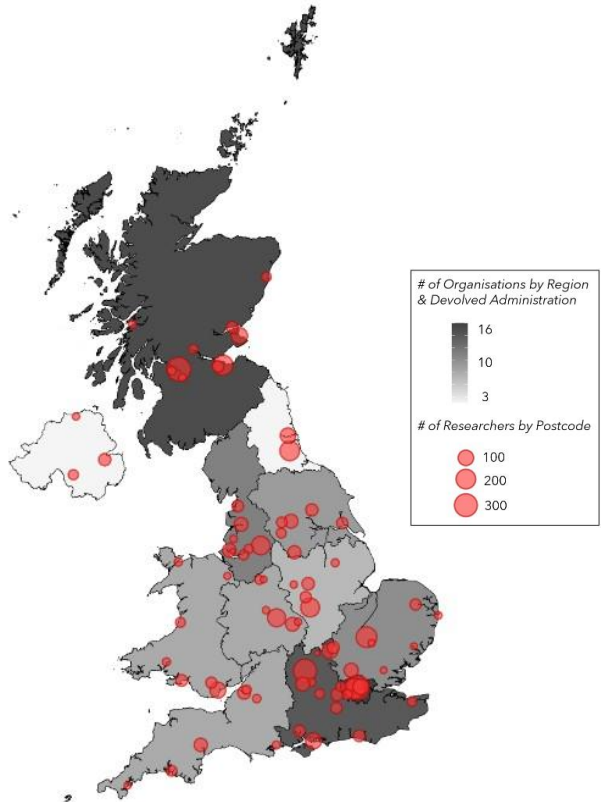
We conducted **thematic analysis** against the impact themes set out above to group evidence into a coherent narrative, and to the greatest extent possible, isolated the attributable role that UK space research organisations played in observed outcomes. We conducted a total of 13 interviews and follow-ups with 15 stakeholders to obtain insights. More detail on our methodology is provided in our *Technical Annex*.

[ii] The capability areas in this study are specific to this analysis and are distinct from those defined by the Department for Science, Innovation and Technology in DSIT. (2026). *Minister Lloyd speech at Space-Comm Expo 2026*. Available at: Link.

2. The UK space research landscape

The UK's academic space research is broad and diverse, with research organisations ranging from universities to specialist research institutes. They employ researchers directly contributing to a broad range of research fields in space – spanning all nine capability areas assessed in this study. We identify a total of **112 UK organisations** currently undertaking space-related research activity, with an estimated total of **over 5,200 space researchers** (5,227) across these organisations at post-doctoral level or above.

Figure 2 Distribution of space research organisations and researchers across the UK



Source: know.space analysis

The UK's academic space research base is geographically diverse, with organisations and researchers in every UK region and devolved administration (DA). This ranges from Northern Ireland and the North East of England with 3 organisations each, to London's 16. Scotland (15) is particularly notable for its high relative concentration, hosting 868 researchers, which equates to 157 researchers per million inhabitants, making it the highest on a population-weighted basis.

As shown in *Figure 2*, UK regions and DAs are varied, with some displaying strong clusters of activity in relatively few organisations (e.g. the North East, where 327 researchers span three universities), while others have smaller research groups distributed across the region/DA (e.g. South West England has 214 researchers across 8 organisations). Overall, we find a broad spread of space research activity across the UK, which is discussed at the (i) organisational and (ii) researcher level in more detail below.

2.1 UK space research organisations

Our landscape mapping counts only research-performing organisations with intrinsic, ongoing space-relevant R&D activity. We explore three types of research-performing organisations, consistent with UKRI and Universities UK lists,[1,2] within the scope of the study:

- Universities
- Independent Research Organisations (IROs)
- Research Council Institutes (RCIs)

Most space research organisations identified were universities, alongside smaller numbers of IROs and RCIs. From the list of 139 Universities UK member institutions, **almost two thirds (64%) have an active space research function**. We identify a wide range of research focuses: from institutions with a strong emphasis on astronomy, space science and missions (e.g. the Armagh Observatory and Planetarium; RAL Space), to organisations applying satellite-derived data in fields such as environmental research (e.g. Plymouth Marine Laboratory; Centre for Agriculture and Bioscience International), to those examining the sector's economics and regulatory landscape (e.g. Chatham House; LSE).

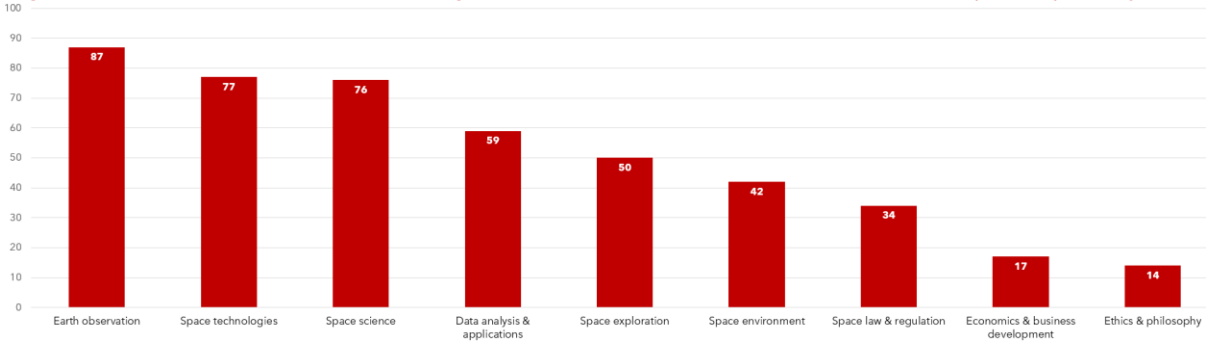
Figure 3 Number and share of space-organisations

	Universities	IROs	RCIs
Number of space-relevant organisations	89	16	7
Share of total space-active organisations	79%	14%	6%

*Due to rounded values, percentages may not add up to 100%

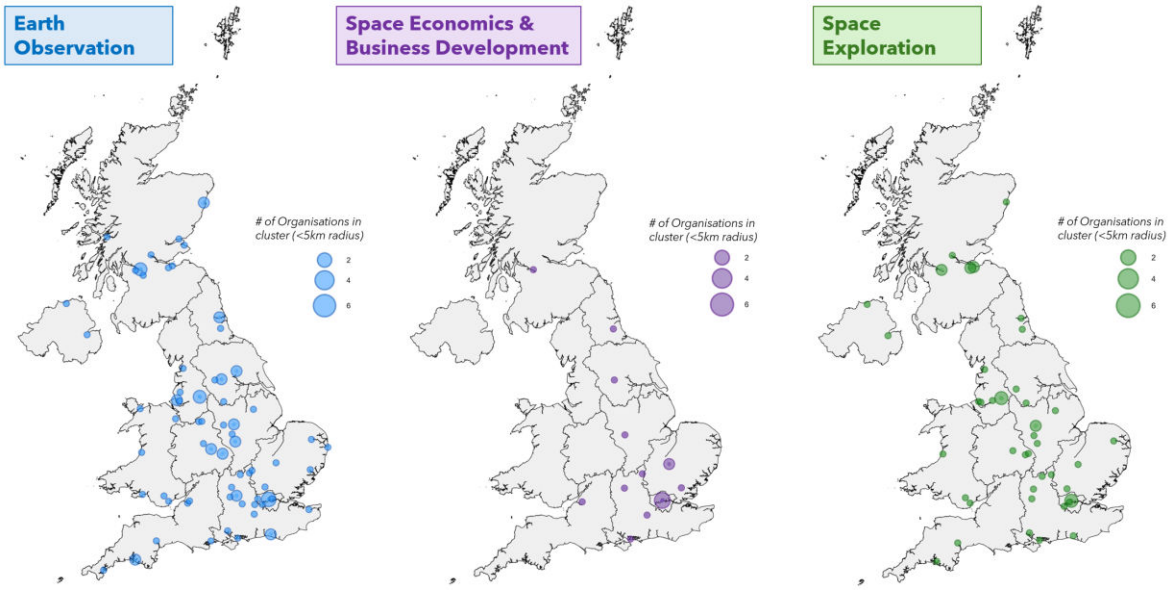
We mapped all 112 organisations by capability area, with many supporting research across several. **Earth Observation (EO) is the most prevalent**, with over 3/4 of space research organisations active in the area, while 'space technologies' and 'space science' research is present in 2/3 of these organisations. There are smaller but significant shares of organisations active in space economics, business, ethics and philosophy research.

Figure 4 Number of UK research organisations with active research functions per capability area



The breakdown by organisation type confirms expected patterns. Universities account for over 90% of 'space science' research organisations, reflecting strengths in astrophysics, fundamental physics, and space instrumentation (and also reflecting choices regarding which organisations were in scope of this study). IROs show a broadly similar distribution of capability areas to universities, but with a proportionally higher share of 'data analysis & applications'. RCIs, by contrast, have the highest share of policy-adjacent capabilities overall, with 'space law & regulation' alone counting for 25% of their mapped areas.

Figure 5 Distribution of organisations with active research across capability areas (examples)



Most (7/12) regions and DAs have full coverage across all nine capability areas. London has a relatively high focus in policy-adjacent areas, accounting for c.1/4 of all organisations active in 'space law & regulation' research, and around one third each of 'economics &

business development' and 'ethics & philosophy', reflecting its role as a regulatory and policy hub. EO, space science, space technologies, and data analysis & applications are relatively evenly distributed across the UK, suggesting these **foundational capabilities are nationally accessible**. This distribution may prompt broader policy questions as to whether funding is spread too thinly across the landscape, potentially limiting the depth of capability building. *Figure 5* highlights example distributions of research activity by selected capability areas. Individual researchers were not mapped to capability areas, due to insufficient data granularity, though this could be an area for potential future research.

Coordination and convening bodies

Beyond the 112 research-performing organisations mapped in this study, there are several strategically important bodies that support the space research base and wider sector. While these are not mapped due to decisions on study scope, they play a distinct role in translating the UK's distributed research capability into coordinated national input.

Two bodies are particularly notable. The Space Academic Network (SPAN) and the Space Universities Network (SUN) act as a **key coordination layer between academia and government**. SPAN provides a single, coordinated academic voice into government and the UK Space Agency, convening consensus across different capability areas. SPAN enables structured responses to consultations and strategy development, such as input to the 2024 Space Regulatory Review[3], leveraging significant in-kind academic effort to support policy and funding processes. SUN focuses on the quality of space teaching across UK higher education. It supports university staff through an annual workshop, a shared repository of teaching resources, facilities and industry case studies, and works with industry to keep curricula current. Where SPAN provides a coordinated research and policy voice, SUN's contribution is principally to the skills pipeline and the student experience.

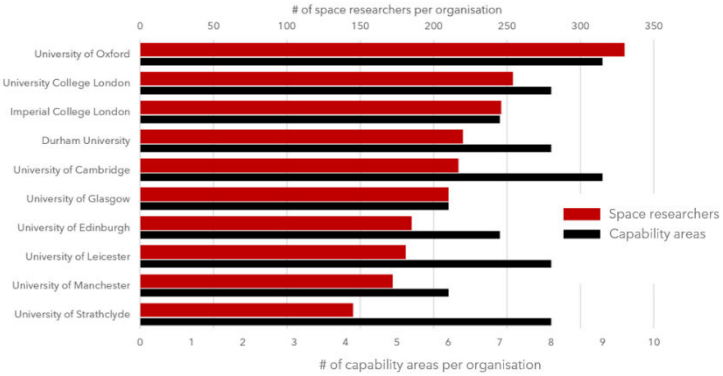
Together, these bodies help bridge a gap that would otherwise exist between a geographically and thematically distributed research base and the concentrated policy and funding decision-making structures of government. The role of these institutions is particularly relevant given current discussions around long-term partnership models for the sector. However, there remains a risk that these bodies are resource-constrained and there are few mechanisms through which academia can identify shared priorities or advocate collectively to government. This is discussed further in *Section 5*.

Other convening and enabling organisations – including the Space Partnership, UK Space Frontiers 2035 thematic panels, learned societies such as the Royal Astronomical Society (RAS) and British Interplanetary Society (BIS), and translational bodies such as the Satellite Applications Catapult – also play clear supporting roles for the UK space research and industry, though remain outside the analytical scope of this study.

2.2 Researchers

A space researcher is defined as an individual at post-doctoral level or above who is actively undertaking research that directly applies to, strongly relies on, or advances space applications. We identified **over 5,200 space researchers** (5,227) across organisations, with 3/4 of all organisations having 50 or fewer space-active researchers. Space research talent is largely

Figure 6 Top 10 research organisations by # of space



concentrated in universities, which average 54 space-related researchers per institution (4,834 total), compared to 11 for IROs (182 total) and 30 for RCIs (211 total). As shown in *Figure 6*, all top ten organisations by number of active space researchers are universities. The top three are the University of Oxford, UCL and Imperial College, while Scottish universities notably account for three of the top 10.

While methodological differences mean direct comparison should be treated with caution, the distribution of space researchers also appears **more varied than the regional composition of the UK space workforce**, as measured in the 2024 Size and Health of the UK space industry study.[4] As shown in *Figure 7*, one third (33%) of all space sector employees are based in London, compared to 16% of the space research base, with a more even spread of research activity across the country than is seen in the wider industry. In some cases, this reflects the influence of individual institutions: the East Midlands (6% versus 3%) for example is largely attributable to the University of Leicester.

Figure 7 Comparison of space researchers and organisations to Size and Health 2024 data

Region / devolved administration	Researchers, % share (this study)	Space sector employment, % share (S&H 2024)	% (and #) of space research organisations (this study)	% (and #) of space organisations (S&H 2024)
South East	17%	17%	13% (14)	22% (621)
Scotland	17%	13%	13% (15)	9% (246)
London	16%	33%	14% (16)	18% (531)
East of England	9%	7%	9% (10)	8% (241)
North West	8%	4%	10% (11)	6% (187)
North East	6%	2%	3% (3)	3% (81)
East Midlands	6%	3%	6% (7)	6% (162)
Yorkshire and The Humber	6%	5%	8% (9)	5% (130)
West Midlands	5%	4%	7% (8)	6% (185)
Wales	5%	4%	7% (8)	4% (105)
South West	4%	8%	7% (8)	12% (333)
Northern Ireland	2%	1%	3% (3)	2% (66)

Legend:
larger share than S&H
moderately larger share than S&H
similar share to S&H
lower share than S&H

On a population-weighted basis, Scotland and the North East have the highest concentration of researchers, while Northern Ireland and the South West have the lowest.

Figure 8 Space researchers (total and population-weighted) and organisations per region / DA

Region / devolved administration	# of space researchers	# of space research organisations	Space researchers per 1m inhabitants	Total number of capability areas
South East	875	14	91	9
Scotland	868	15	157	9
London	830	16	91	9
East of England	445	10	68	9
North West	433	11	56	7
North East	327	3	118	9
East Midlands	307	7	61	9
Yorkshire and The Humber	288	9	51	8
West Midlands	284	8	46	7
Wales	271	8	85	8
South West	214	8	36	9
Northern Ireland	85	3	44	5

Our estimate of 5,200+ UK space researchers is **higher than other estimates of the size of the UK space research ecosystem**. Other estimates often have narrower scope, e.g. the *2024 Royal Astronomical Society survey* identified 2,453 researchers active in Astronomy and Geophysics,[5] while our previous *SPAN Study* identified 2,050 *space science* researchers from 53 universities at the same level of seniority.[6] The most directly comparable resource in terms of scope is the Satellite Applications Catapult *Academic Expertise Portal*, which leverages a similar taxonomy and inclusion criteria. This identifies 2,018 researchers,[7] though developers acknowledge this is likely a significant underestimation. This study has enabled an AI-enhanced (and manually validated) 'deeper dive' into the research ecosystem, enabling previously non-identified researchers to be included.

While this study does not attempt to analyse trends over time and has a different scope to previous work, our professional judgement is that there has likely to have been real growth in research activity since our 2021 SPAN study. This growth could be driven by a combination of factors, including sustained public investment in space research, the continued development of regional research clusters, and a broader recognition of the commercial opportunities presented by the space sector as it grows in size and strategic importance. Though outside the scope of this study, trends and changes in the focus of research activity could be explored in more depth in further research, with this study acting as a reference point for future-looking or retrospective analysis.

3. Funding for UK space research

Alongside landscape mapping, we examine the high-level distribution of funding to the space research base, and the magnitude of these flows. Research funding is a complex patchwork of (primarily) public and private sources, with variance in the coverage of public databases, different timelines, definitions, and scopes. Given these limitations, the figures presented focus on major funding channels for which publicly available or officially provided data exists. They should be regarded as indicative estimates rather than comprehensive totals. Nevertheless, they provide a meaningful lens through which to understand the scale and distribution of public funding supporting UK space research.

Based on available information we estimate that **over £260m of competitively awarded funding flows annually to the UK space research base**. We examined publicly available data from UKRI, the UK Space Agency, the European Space Agency (ESA), Horizon Europe, and defence-related research funding, conducting an in-depth analysis of funding included in the Gateway to Research database (covering over 60% of total research funding analysed here). For other funding flows, detailed evidence on recipients was typically not available, so this is intended as an **indicative rather than comprehensive analysis**.

As discussed below, it does not include (for example) institution-own funded research enabled by block grant (Quality-Related) funding, or cross-subsidised research from other internal sources of income. Space-relevant research is also funded through programmes not explicitly labelled as 'space', including multidisciplinary and cross-cutting streams, e.g. the UKRI Strategic Priorities Fund, and sources focusing on adjacent areas such as AI, environmental science, agritech, and others. Some funding sources will therefore not be captured in this space-specific funding analysis. The 'true' amount of space research funding is likely to be significantly higher than estimates included here.

The figures presented here reflect what has been funded, rather than the full scale of demand from the research community. For example, according to the *UKRI Investment and Outputs 2015-16 to 2024-25* report, the number of funding applications to UKRI has doubled since 2017-18, while the number of awards has remained broadly flat, reducing the overall award rate from 36% to 19%[8]. While this success rate is not space-specific, it highlights an **increasingly competitive UK funding landscape**.

Public data is not comprehensive enough to fully quantify total public spend on delivering the National Space Strategy across all funding sources, limiting our ability to assess how funding aligns with strategic objectives. This could however be explored in further research.

A comprehensive international benchmarking of funding allocated to academic space research is beyond the scope of this study, though this represents an important area for future work. As broader contextual evidence, the UK was the fifth-largest contributor at ESA's Ministerial Council (CM25), committing approximately €1.7bn of the overall €22.1bn package, compared with approximately €5.1bn from Germany and €3.7bn from France.[9]

However, ESA ministerial subscriptions are **not direct measures of academic research expenditure**, as they also support launch systems, industrial capability, commercial programmes, security initiatives, and wider space-sector development.

Germany and France additionally maintain substantially larger sovereign national space programmes alongside ESA participation. France's national space agency, CNES, operated with a 2024 budget of approximately €2.37bn, including over €1bn in ESA contributions.[10] By comparison, the UK Space Agency operates on a materially smaller budget base. Consequently, while ESA contributions should **not be treated as a direct proxy for academic research funding**, broader evidence suggests the UK may invest less overall in space academic research than leading European comparators such as Germany and France, if trends reflect overall national space budgets.

3.1 UK Research and Innovation (UKRI)

UKRI is the UK's largest public funder of research, with over £8bn invested annually across the seven disciplinary Research Councils, Innovate UK, and Research England.[11] Working across all UK regions and DAs, UKRI is a major funder of universities and other research organisations. Information on UKRI funding awards is stored on the Gateway to Research (GtR) platform, which provides coverage of over 173k funded research projects across UKRI councils. GtR therefore forms a cornerstone of this funding analysis.

However, GtR data does not capture quality-related (QR) funding, a major block-grant stream totalling several billion pounds annually, which is allocated to institutions based on Research Excellence Framework (REF) performance.[12] As QR funding is not tied to specific projects and is spent at institutional discretion, it cannot be reliably attributed to space research. Consequently, the figures presented represent a share of the UKRI's competitive funding streams, rather than the full value of UK public funding underpinning space research. Nevertheless, they provide a useful indication of how non-QR UKRI funding is distributed across organisations, research councils, and geographical areas.

Applying a weighted keyword search methodology (to identify space-related research projects) to currently active grants,[iii] we identify **595 active space research related grants, totalling £633m in value** with an average grant duration of just over three and a half years. On average, this is equivalent to approximately **£174m per year**. The Science and Technology Facilities Council (STFC) has awarded approximately £410m in total across these grants, representing around two thirds (65%) of total active funding. The Engineering and Physical Sciences Research Council (EPSRC) and Horizon Europe Guarantee follow, contributing to £67m and £66m in total active grants respectively.

Across the total of all active grants, Imperial College London has received the highest amount of space-related research funding from UKRI (£59m), followed by the Universities of Oxford (£46m), Manchester (£42m), Edinburgh (£39m), Glasgow (£39m), Cambridge (£36m) and UCL (£31m). However, large amounts of funding are clustered around a subset of organisations, with three quarters (73%) of recipients receiving less than £10m in total, half (52%) less than £5m, and a third (32%) less than £1m.

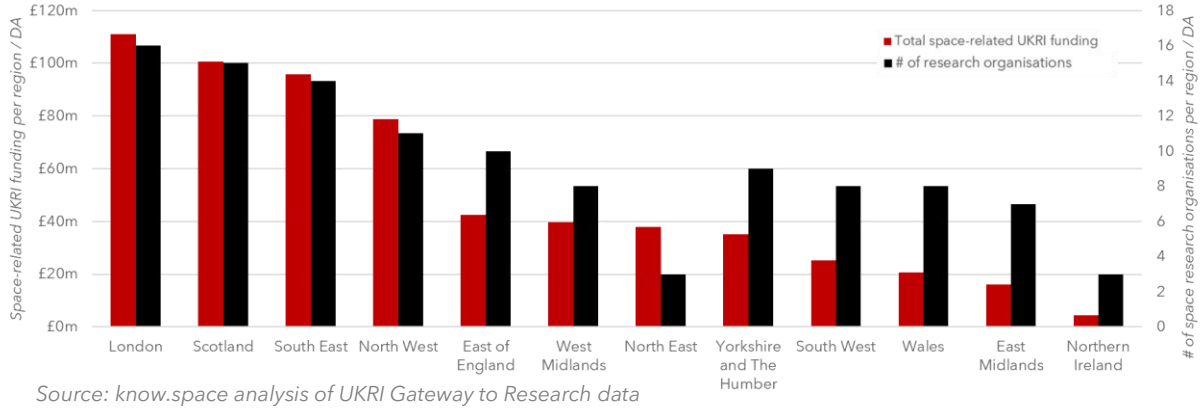
The regional distribution of UKRI funding is more concentrated than the landscape mapping results suggest. The top four regions and DAs – London, Scotland, the South East and the North West - represent one third of the UK's regions and DAs but receive almost two thirds (64%) of total space-related, active UKRI funding. For regions with the most

[iii] We focus on active grants on the basis that this gives a clearer depiction of current research activity. Further research could incorporate concluded grants for greater insight on historical flows and changes over time.

funding, there is a broad correlation between funding levels and the number of organisations undertaking space-related research, as illustrated in *Figure 9*. However, many regions/DAs with relatively strong organisational presence receive comparatively modest amounts of funding, highlighting a common divergence between the distribution of research capacity and the allocation of competitive (UKRI) funding. This trend may also partly reflect the size of space-relevant research departments in these universities.

A notable exception to this trend is the North East of England, where three organisations secured funding levels comparable to regions with over double the organisational presence. This trend is driven by large research projects, such as a £7m consolidated 2023-2026 Astronomy Programme grant at Durham University. This grant has supported researchers to collaborate globally, producing ultra-high-resolution maps of dark matter,[13] and analysis of radiation damage to the Hubble Space Telescope during solar cycles.[14]

Figure 9 Space-related UKRI funding (GtR only) by region and devolved administration



Source: know.space analysis of UKRI Gateway to Research data

3.2 UK Space Agency

The UK Space Agency plays a central role in supporting academic space research. UK Space Agency internal analysis (reproduced here with permission) estimates that of c. £1.6bn in total UK Space Agency funding to the UK space sector from the last five calendar years (2021-25), **around 25% flowed to the UK research base**.[iv] The UK Space Agency channels funding to research organisations through two primary routes: European Space Agency (ESA) programmes and National programmes.

European Space Agency funding

Through the UK's participation in ESA, UK Space Agency internal analysis estimates that of c. £1.3bn in UK Space Agency funding via ESA to the UK space sector from the last five calendar years (2021–2025), **around 10%** was awarded to UK research organisations. ESA operates under the principle of geo-return, whereby member states receive contracts and financial returns broadly proportional to their contributions. Although a significant share of ESA contracts is awarded to industry, academic organisations play a key role participating as consortium partners (or leads) in mission development and scientific research.

[iv] Note: Here and in the following sub-sections, the UK Space Agency analysis uses a slightly wider scope/definition of "research organisations", including organisations such as the Met Office and NERC centres that are out of scope of our GtR analysis. From discussions with the UK Space Agency we understand this is unlikely to have a significant impact on the results. We do not calculate average annual figures here, but include these in our overarching estimate presented above.

National programmes

The UK Space Agency's National programmes are a significant channel for space research funding. UK Space Agency internal analysis estimates that of c. £300m in UK Space Agency direct funding to the UK space sector via national programmes from the last five calendar years (2021-2025), **around 70%** was awarded to UK research organisations. Academic organisations are supported through National space programmes, including the National Space Innovation Programme (NSIP), the Centre for Earth Observation Instrumentation (CEOI), and the International Bilateral Fund (IBF), which strengthen UK R&D capability and the commercialisation of research. National funding is also leveraged to secure UK leadership roles on ESA science missions, building on mandatory contributions to the ESA Science Programme budget to secure additional scientific and strategic returns.

3.3 Horizon Europe

Horizon Europe is the world's largest civil research funding programme, with a total budget of €93.5bn allocated between 2021 and 2027.[15] The UK's withdrawal from the EU in 2020 influenced UK participation in the programme during this window, until it rejoined under a bespoke deal in 2024. Prior to this, UK researchers received funding through the UKRI Horizon Europe Guarantee scheme (included in the GtR analysis above) and now receive funding directly from the European Commission (not included in GtR).

Since 2024, we identify a total of 43 UK space-related research projects on CORDIS, the European Commission's primary database for EU-funded R&D projects. Although this may not be comprehensive, it indicates that UK academia has secured around **£23m in grant funding** through these channels, averaging around **£6m per year**. This includes £3m to the University of Oxford to combine supercomputing models to understand black holes and their astrophysical impacts as part of a pan-European consortium,[16] £2.5m for the University of Warwick to investigate solar coronal heating challenges,[17] and £2m to the London School of Economics (with the University of Bristol as a partner) to explore philosophical notions of 'the edge of the universe', through an interdisciplinary team.[18]

3.4 Other Sources

Beyond the major public funders of space research in the UK there are many other funders which, while significant, are **challenging to comprehensively assess**. Due to the fragmentation and often private or classified nature of these sources, figures presented in this study only partially capture the total funding pool available to UK space researchers.

Industry partnerships for collaborative R&D, charitable grants and donations, and consultancy arrangements can all fund space research, though specific figures are typically not publicly available. Learned societies such as the Royal Astronomical Society, and independent foundations such as the Leverhulme Trust, also provide grants and fellowships across relevant disciplines. Public bodies such as the Met Office also commission and co-fund research with academic partners, and venture capital supports the commercialisation of university-led space research, though these flows are difficult to quantify systematically. Moreover, universities may re-invest income from commercial activities (e.g. licencing and selling spinout company shares), to support research activities.

Defence-related funding also plays a role, with UK universities key in developing sovereign capabilities and dual-use assets (as discussed in *Section 4.5*). The Ministry of Defence spent a total of £3.1 bn on R&D in 2024/25,[19] though its classified nature limits visibility of funding flows to space-related research. While the specific allocation to space-related academic organisations is not publicly disclosed, we provide a conservative estimate. Defence Science and Technology Laboratory (Dstl) has allocated £51m to universities through

research contracts and grants between financial years 2022/23 and 2023/24. Assuming around 10% of this funding was directed to space-related research, this would equate to approximately £2.5m annually. This rough order-of-magnitude estimation is not included in our total presented above.

The Advanced Research and Invention Agency (ARIA), sponsored by DSIT, also funds breakthrough R&D projects across domains such as AI and quantum, with some funded projects focusing on space-based climate interventions and Earth monitoring. A key example is the *Forecasting Tipping Points* programme – an £81m interdisciplinary initiative to develop early warning systems for climate change response. Within this programme, researchers from the Universities of Glasgow and Strathclyde, alongside the Scottish Association for Marine Science (SEMS), are developing novel hybrid communication and sensing platforms, which coordinate underwater optical communications antenna with satellite imagery, to map hydrography across space and time.[20] Taken together, internally funded research and the wide range of additional sources mean total funding for space research activity is likely to be **significantly higher** than the figures set out in this study.

4. The impact of UK space research

This section examines how space academic research and expertise contribute to the performance, sustainability, and strategic value of the UK space sector, while also delivering wider economic and societal benefit. We highlight some key routes to impact through which academic research translates into space sector growth, capability development, and broader 'spillover' benefits. Academic impact covers scientific discovery, policy influence, skills development, innovation, national capability, and international competitiveness. The following subsections explore these dimensions in turn, highlighting key examples of materialised impact. Across each impact theme, universities and research institutions are highlighted as key national assets, acting as enablers of impacts beyond their own organisations, with impacts linked to the long-term evolution of national capabilities and the growth of regional economies and the wider UK space sector.

We do not attempt to provide a comprehensive account of UK space research activity and its impact, but to showcase examples through thematic lenses. For example, this impact summary will underplay crucial spillover impacts (e.g. flows of knowledge to non-space domains, in turn leading to new advances and resultant socio-economic benefit), which are inherently challenging to track. Throughout this section, case studies are used as spotlight examples of high-impact activity within their respective impact themes.

Figure 10 Impact themes and associated case studies

Impact theme	Case study
Scientific advances	Gaia Mission – from mapping the galaxy to identifying cancer tumours
Innovation & commercialisation	Supersharp Space Systems – from astronomy to commercialised EO technologies
	Space South Central – the wider role of space research in catalysing regional growth
Skills & knowledge	Ariel data challenge – building the pipeline of AI expertise for exoplanet characterisation
	RAL Space – building decades of UK EO expertise
Policy, licensing & regulation	AstrobiologyOU – shaping the rules of space exploration
Defence, security & resilience	University of Strathclyde – research across capability areas applicable to UK security

Impact theme	Case study
Competitiveness & reputation	DAMAGE/RENEGADE – modelling the future of space sustainability
	Heriot-Watt University – enhancing visibility through collaborations

4.1 Scientific advances

UK academia plays a central role in **advancing fundamental and applied space research**, underpinning the UK's contribution to global space knowledge. Universities and research organisations lead and support internationally significant research through missions, programmes, and R&D projects. These advances not only expand understanding of the Earth and wider universe but also provide the evidence base and technical foundations on which downstream applications, services, and policy decisions depend.

Space science and exploration

The UK space research community plays a critical role in advancing scientific discovery – both in terms of the design, manufacture, launch and operations of spacecraft, as well as through scientific exploitation of data generated through space science missions.[6] Many of these activities are underpinned by roles on ESA missions, with UK researchers holding a total of 37 Principal Investigator (PI) or Co-PI roles across 28 ESA missions since 1975.[21] This equates to UK representation in 13% of ESA space science mission leadership roles, with other UK researchers leading subsystems and mission instrument development.

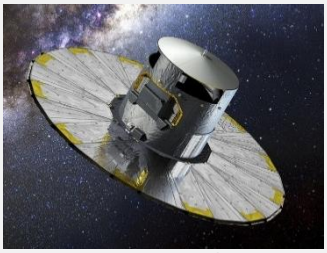
The UK space research base is also globally leading in the scientific exploitation of mission data. While citations are not a standalone measure of impact, the UK is ranked 2nd globally within the top 10% of most cited publications in astronomy and space research between 2000 and 2020,[22] indicating a highly internationally influential research base.

The UK space research base has long-standing heritage in space mission design and operations across a range of fields. Examples of legacy missions include:

- ***The ESA Rosetta mission*** *(2004-2016)* which led to unprecedented insights into the evolution of comets: the Open University led the Ptolemy instrument team, while the Armagh Observatory, Imperial College London, UCL/MSSL, Oxford University, and Queen Mary University of London were also involved in the mission.
- ***The ESA Herschel mission*** *(2009-2013)* which was central to studying the cold universe and the formation of stars and galaxies. Cardiff University led one of three key scientific instruments (SPIRE), while the mission featured involvement from Imperial College London, UCL, STFC RAL Space, the University of Sussex, and the UK Astronomy Technology Centre.[23]
- ***The ESA Gaia mission*** *(2013-2025)* which is discussed in detail below.

The UK demonstrates leadership across many major ESA and ESA/NASA missions. UK institutions including STFC RAL Space, Imperial College London, UCL/MSSL, Cardiff University, the University of Leicester and the UK Astronomy Technology Centre play key roles on the James Webb Space Telescope (the multi-billion-dollar flagship mission, operational since 2022) in instrument development (especially MIRI, the development of which was co-led by Prof. Gillian Wright, as European PI), calibration and science exploitation. UK teams are central to ESA's Euclid (~€1.4bn mission launched in 2023; survey operations began in 2024), with leadership in cosmology science and data processing. Imperial, UCL/MSSL, Leicester and RAL Space contribute to Solar Orbiter (operational since 2020) and JUICE (~€1.6bn mission, launched 2023; Jupiter arrival 2031). Looking ahead, the UK, led by RAL Space, Glasgow and Birmingham, has a foundational role in LISA (launch planned 2035), the UK leads the science community and payload integration for Ariel (launch planned 2031) and contributes key instrumentation to Comet Interceptor (launch opportunities between 2028-2029 being identified).[24]

The Gaia Mission case study: from mapping the galaxy to identifying cancer tumours

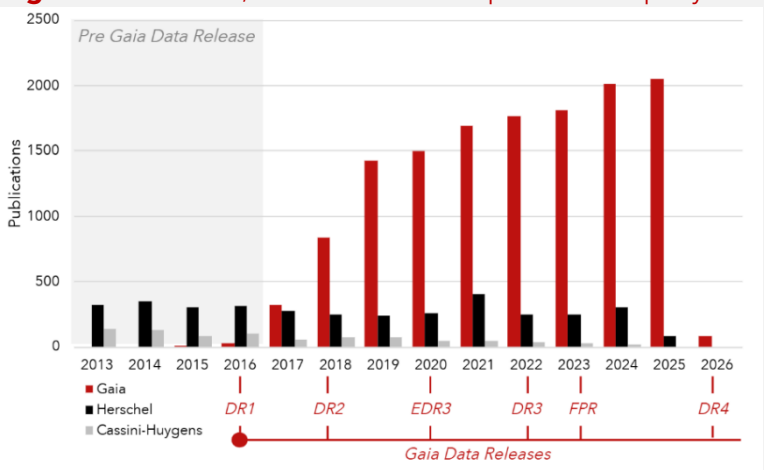


Source: ESA Gaia Website

The ESA Gaia mission, operational between 2013 and 2025, has created the **largest and most precise 3D space catalogue ever made** – including measurements of up to 2.5 billion stars, quasars, exoplanets, comets and asteroids. A key aspect of the mission's value is through being a 'reference frame', essential to astronomy and astrophysics.[25] Between 2013 and 2023, the UK invested **£25.4m** into the programme, through the UK Space Agency and STFC, providing multi-year support.[25] The UK had major roles in building the spacecraft, and retains a key role in delivering the science. 50 people across 6 institutes contributed to the mission in the UK, including UCL, who played a key role in developing the Radial Velocity Spectrometer, and the University of Cambridge which hosts a data processing centre.[26] RAL Space, Open University, and the universities of Leicester and Edinburgh also contributed to the mission, with 3 of the 9 Gaia data processing coordination units hosted in the UK.

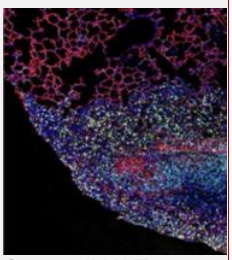
Gaia generated 500GB of data per night, producing a rich dataset through a series of 5 data releases (with a 6th scheduled in 2026). This data has been foundational to the scientific community, supporting over 15,000 scientific publications, which have been cited 417,000 times. As highlighted in *Figure 11*Figure 11 # of Gaia, Herschel & Cassini, the Gaia mission has become **the most productive ESA space science mission**, as measured by the number of publications. While UK academics played a key role in developing the data underpinning these publications, UK affiliated researchers have also authored 1/3 of Gaia-related publications.

Figure 11 # of Gaia, Herschel & Cassini publications per year

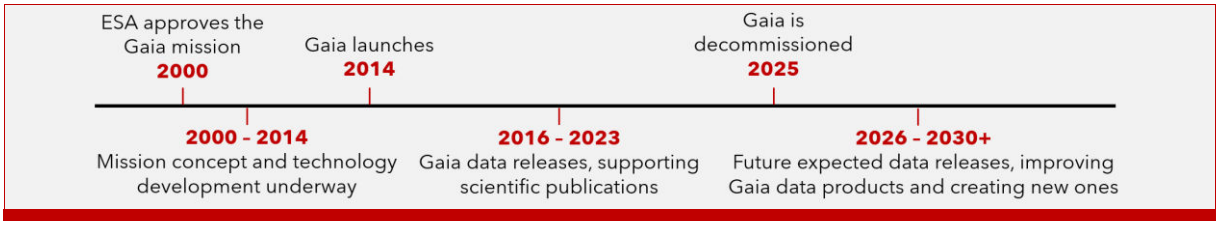


know.space analysis of NASA ADS publication data

To handle large volumes of Gaia data, researchers at Cambridge developed sophisticated software to extract faint signals of objects from dense star-field images. The team discovered that similar techniques could be applied to identify **cancer tumours at the cellular level**. Gaia researchers formed part of the Cambridge IMAXT (Imaging and Molecular Xenografts and Tumours) grand challenge team, funded by Cancer Research UK. The IMAXT team developed the world's first virtual reality map of cancer, enabling the behaviour, location and characteristics of tumour cells to be analysed at the same time. This research has led to 5 patents, 35 publications, and is revolutionising the diagnosis of cancer and enabling more personalised treatment.[27]



Source: IMAXT



Earth Observation & climate science

The UK has **strong heritage in Earth Observation (EO), with long-standing expertise in specialised instrumentation**.[28] UK researchers collaborate extensively through international EO programmes, including the EU's Copernicus programme, which the UK re-joined in 2024. The University of Sheffield and National Centre for Earth Observation (NCEO) conceived and now lead the ESA BIOMASS science team, with major contributions from Leicester, UCL and Edinburgh.[29] The mission produces 3D maps of global forests, improving monitoring of carbon storage, climate change and the Earth's carbon balance.

UK researchers play a key role in the analysis of EO data across a wide range of applications (see *Sections 4.2*, *4.3*, and *4.4*). For example, the UK-headquartered European Centre for Medium-Range Weather Forecasts (ECMWF) developed one of the world's most influential climate datasets (ERA5) within the Copernicus Climate Change Service in 2020.[30] The associated research article has been **cited over 26,000 times**, demonstrating the importance of internationally coordinated EO data analysis, hosted in the UK, in underpinning global climate research.

Keyword searches of the NASA Astrophysics Data Systems (ADS) database indicate that UK authored publications referencing EO have increased five-fold between 2016 and 2025. Zhao et al. (2022) rank the UK as the sixth largest producer of EO publications worldwide and second in Europe.[31] However, identifying EO-derived research at scale has challenges, due to its wide disciplinary reach and inconsistent citation of EO data sources. Therefore, aggregate publication trends should be interpreted with caution.

Space weather & space environment

The UK-led Space Weather Instrumentation, Measurement, Modelling and Risk (SWIMMR) programme advances knowledge of space weather affects to systems on Earth. The £20m, four-year programme has delivered models and risk assessments to support UK resilience.[32] The UK is also playing key instrument roles on the ESA Vigil mission, notably UCL/MSSL and Imperial. Vigil focuses on space environment monitoring to provide early warnings of solar storms, potentially contributing to avoiding billions of pounds of damage to the UK economy.[33] UK-led science spans observation of the space environment and assessment of impacts on Earth, strengthening space weather resilience (discussed in *Section 4.6*).

Space sustainability & space domain awareness

The UK is a leading contributor to space sustainability and space domain awareness (SDA), with the **UK Space Agency currently chairing the Inter-Agency Space Debris Coordination Committee** (IADC). UK researchers contribute modelling capabilities informing space debris regulations and mitigations, as discussed in *Section 4.6*, while advancements in astronomical data analysis in the UK are also being repurposed to enhance SDA capabilities. For example, AI/ML techniques initially developed to identify exoplanet transit spectra at UCL have been central to the operational capabilities of leading UK SDA company Spaceflux - founded by UCL researchers in 2022.[34] These capabilities are key to protection of UK and global satellites, as well as the social, economic, and strategic value reliant upon these assets, with 18% of UK GDP reliant on satellite services[4] (see below).

Satellite communications

The Integrated Quantum Networks Hub, supported by over £43m of EPSRC funding and industry contributions, is a major UK collaboration spanning 14 universities, NPL, RAL Space and industry, delivering internationally significant advances in satellite communications, particularly secure optical and quantum links. The Hub leads the Satellite Platform for Optical Quantum Communications (SPOQC) mission, supported by the Heriot-Watt Optical Ground Station, a national facility enabling **space-to-ground quantum key distribution**.[35] In parallel, the UK–Singapore SpeQtre mission, led by RAL Space and launched in 2024, places the UK among a small number of nations demonstrating quantum communications from orbit. These activities complement UK global leadership in ground-based ultra-secure data transfer by unlocking potential for international, satellite-based secure quantum communications, to protect critical sectors, e.g., banking and healthcare by providing "near un-hackable" internet, protecting companies against financial losses, and the welfare and safety of patients.[36, 37]

Propulsion and space technologies

Cranfield University's Ordnance Test and Evaluation Centre (COTEC) has supported successful chemical rocket engine testing with Pulsar Fusion, contributing to advanced propulsion and plasma thruster development. In parallel, a Leicester–NASA collaboration has demonstrated, for the first time, the long-term reliability of an Americium-fuelled Radioisotope Stirling Generator, enabling extended mission lifetimes for space assets. Extended mission lifetimes increase the volume and continuity of mission data, ultimately enhancing the quality of data / insights that deliver socio-economic benefits on the ground.

In 2024, the University of Leicester launched a new spin-out company, Perpetual Atomics, to harness and commercialise these breakthroughs.[38] Together, these activities showcase the UK's contribution to technologies critical for launch and deep-space missions.

Research spillovers to non-space fields

UK space research draws on cross-cutting research capabilities, **re-purposing space-focused technologies and methods for other sectors, leading to real-world impacts in terms of economic growth, productivity, and welfare**. For example, a consortium of the Universities of Manchester, Lancaster, and Aston adapted NASA Mars Rover technologies for nuclear decommissioning at the Sellafield nuclear site.[39] This relatively cheap technology will enable cost-effective and safe routes for gathering data on potentially hazardous materials. Queen's University Belfast's Centre for Wireless Innovation (CWI) delivers internationally respected research with impact across both space and non-space sectors, while the group successfully demonstrated an antenna breadboard for ESA's Ariane launchers.[40] Its advances in antenna design and remote sensing also underpin satellite communications and EO, while technologies have also been translated into terrestrial applications in real-time security and wearable sensors.[41] Since its establishment in 2016, CWI has received 15 research awards and has catalysed the spin-out company AntennaWare,[42] which applies CWI-developed wireless technologies to wearable sensor solutions across industrial, medical, sports and audio/media markets.[43]

4.2 Innovation & commercialisation

The UK space sector is economically and strategically significant to the UK economy, generating £18.6bn revenue in 2022/23, with almost £1 per £5 (18%) of UK GDP reliant to some extent on space and satellite services.[4] **Academic research is a driver of innovation and commercial activity**, generating and de-risking novel technologies, methods, and insights that translate to commercial value through spin-outs, licencing, and collaborative

R&D with industry. Research organisations also often **anchor regional innovation ecosystems**, providing support for companies to spin-out and scale up.

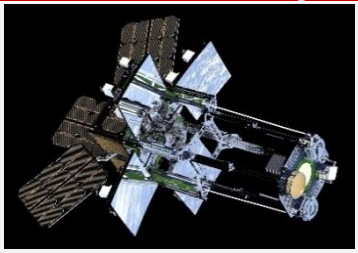
Commercialisation of academic research

Academic research organisations play a critical role in supporting a pipeline of intellectual property and capability development which enable spin-out companies to commercialise. Across all sectors in the UK, there are a total of 1,609 active university spinout companies founded since 2011.[44] Some of the UK's most successful space companies have **origins in academia** – including Surrey Satellite Technology Ltd (SSTL), iCOMAT, Blue Skies Space, Oxford Space Systems, and Nu Quantum, which have historic links to the universities of Surrey, Bristol, UCL, Oxford, and Cambridge respectively. Collectively, these five companies have **attracted £108m in investment from public and private sources** and have created at least **214 high value-added jobs** in the UK.[v, 45] Sustained investment in academic research and spin-out / knowledge exchange mechanisms can deliver measurable economic impact, strengthen national space capabilities, and underpin long-term growth in the space sector.

Academic spinouts span the UK space value chain, with many also operating in other sectors. For example, cross-cutting spin-out companies in the UK provide capabilities in AI, quantum, photonics, advanced materials, sensing, robotics, and precision engineering. The University of Southampton has catalysed at least 9 space-related spin-out companies across wide-ranging market segments, including OHMSpace (satellite electric propulsion),[46] Symetrica (radiation detection developed for ESA's INTEGRAL Space Telescope applied to terrestrial security markets),[47] and Aquark Technologies (quantum position, navigation, and timing system providers).[48]

Supersharp Space Systems case study: astronomy to commercialised EO technologies

Supersharp began at the University of Cambridge in 2017, where researchers were developing an unfolding telescope concept for astronomy. This capability was repurposed to develop thermal infra-red (TIR) telescopes for EO, leveraging self-aligning, folding optics technology to provide **resolution enhancements of up to ten times**, relative to other optical solutions. These capabilities have wide applications, such as monitoring energy-efficiency, maritime security, monitoring crop health, and heat signature tracking for defence and security applications. Supersharp are also using TIR imaging to develop ground-based systems to monitor space assets.



Source: Supersharp Website

Source: Supersharp Website

Early support from Cambridge Enterprise and Accelerate Cambridge was central to the formation and growth of Supersharp, as the university commercialisation ecosystem became early investors in the company, and guided growth with business and 'pitch deck' support in the early stages. UK Space Agency, ESA, Innovate UK, and Dstl support has also been crucial for the development and demonstration of satellite and ground-based imaging capabilities, helping to accelerate Supersharp's transition from R&D to commercial stages. This support included £5m in UK Space Agency NSIP funding.[49] Continued multi-year funding has been key to sustaining technology

[v] Figures are based on know.space analysis of Dealroom data. Job creation value reflects the current headcount of the selected active companies (as of February 2026). SSTL was acquired by Airbus Defence and Space UK in 2009, and employees are not counted in the figures presented further down in this paragraph.

development for market readiness. Supersharp is scheduled to launch its first instrument on the Blue Moon mission in 2027, with the ground-based Alert mission due to begin in 2026.

In 2023, SATLANTIS acquired a controlling interest, further raising resource and access to key infrastructure, as well as widening Supersharp's potential addressable market in Europe. Supersharp has now grown from 3 to 40 UK employees, supporting growth of high-skilled, value-added roles in Cambridge. There is potential for further growth as the company's upcoming missions are launched.

Source: Cambridge Independent

Supporting growth of the UK space industry

Universities also play a central role in developing regional ecosystems of business activity by providing a **talent pipeline, hubs of knowledge exchange, commercialisation support, and key national research facilities / testing infrastructures**. There are 14 space clusters in the UK, bridging research, industry and government. Universities play a key coordinating role in many of them, enabling businesses to start-up and scale-up with targeted support. In the 2024 'Size and Health' survey, 24% of responses cited local cluster support as a key growth enabler, the 3rd highest cited factor behind UK Space Agency and ESA support. For example, the Universities of Glasgow and Strathclyde are key contributors to the West Scotland Space Cluster advisory group, working with industry to link end-to-end components of the space value chain, and develop regional skills strategies.[50]

UK **academia also hosts and operates nationally and internationally significant research and testing facilities**, such as laboratories, clean rooms, and other research infrastructures. These are crucial in lowering access barriers for SMEs or new market entrants, which lack sufficient capital to internally invest in comparable facilities. For example, the National Satellite Test Facility at Harwell, a £116m investment operated by RAL Space which opened in 2024, provides space-environment testing capabilities crucial for satellite development and validation. Additionally, the National Physical Laboratory (NPL) provides key measurements and precise timing centres for the development and testing of space infrastructure.[51] The Higgs Centre for Innovation is funded through a £10.7 million UK Government investment, with STFC providing a further £2 million over five years to operate it, supporting space start-ups and SMEs with affordable facilities for the small satellite sector.[52] Since its opening in 2018, companies at the centre have secured over £25m in funding (as of May 2025).[53] These academic facilities, and others, **underpin the UK space value chain, accelerate marketisation, attract investment, and generate revenues and jobs** in the UK space sector.

Space South Central case study: universities catalysing regional economic growth

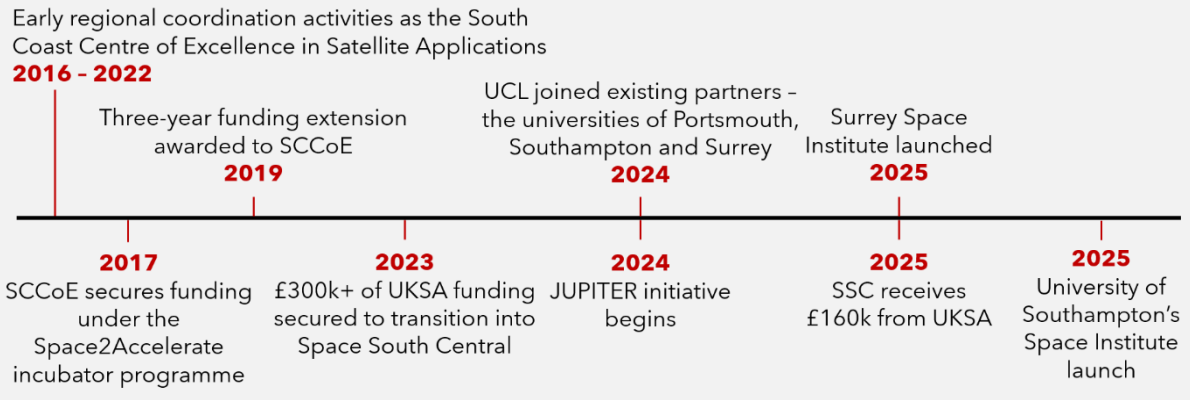
The Space South Central cluster demonstrates how the UK's space academic base can act as a catalyst for regional growth through academia-industry networks. It began from a Satellite Applications Catapult initiative – the South Coast Centre of Excellence in

Satellite Applications – before transitioning into Space South Central in 2023. Alongside UK Space Agency funding, the cluster is co-funded equally by four university partners: University of Portsmouth, University of Southampton, University of Surrey and UCL, positioning academia at the cluster's core. Sustained co-investment has, thus far, provided stable resourcing for business support, upskilling and innovation. They have **delivered 5000+ hours of business support for 200+ space-related organisations**, with universities playing a key role - providing access to specialist facilities, technical expertise and student talent. Initiatives such as Cosmic Capital (which leveraged business incubator expertise at the University of Surrey)[54], and the Space Enterprise Labs (an incubator network at the University of Surrey and UCL), are two key examples.

The universities also lead the Joint Universities Programme for In-Orbit Training, Education and Research (JUPITER), one of several initiatives driven by the cluster which **provides students with industry experience and training**, such as in spacecraft engineering. JUPITER is designed to address industry-identified skills gaps in the space sector, enhancing student capabilities and career prospects whilst strengthening the talent pipeline in consultation with industry.

Source: University of Surrey website

Space South Central operates in one of the most productive regions in the space sector, with organisations in the region generating £3bn in space-related income.[55] Universities have contributed to this growth through the generation of spin-out companies (e.g. Ohm Space and AccelerComm), training provision, knowledge spillovers, and access to facilities such as cleanrooms, testing, and propulsion labs. Through the cluster, university-affiliated staff are also key to driving regional growth through investment and contract opportunities. For example, Portsmouth was a host institution for the ESA Business Applications and Space Solutions (BASS) programme. Working through the cluster, the BASS ambassador supported 13 successful BASS projects across the South East between 2022 and 2025, with a total value of £13m.[56] Moreover, the cluster's International Partnerships Manager (based at the University of Surrey) has led a series of missions to catalyse international collaboration and attract investment. The cluster facilitated Ramon.Space's UK establishment at Surrey Research Park in 2024, attracting £10m investment to the region and creating 40 jobs.[56] These examples demonstrate how universities play a central role in shaping economic growth through regional innovation ecosystems, driving income and employment growth, alongside long-term economic competitiveness.



4.3 Skills & knowledge

As of 2024, the UK space sector employs ~55,500 people, of which around 2/3 are university educated (the highest proportion of any UK sector).[4] Universities are a primary source of the skills, knowledge, and talent required by the UK space sector. Through undergraduate and postgraduate education, apprenticeships, and doctoral training, **academia supplies a highly skilled workforce** for the space sector. In addition to courses, academic training also encompasses technical and project management-based upskilling through the delivery of R&D projects, space programmes, and missions. This helps sustain long-term organisational capabilities essential for the UK space sector, as well as the wider economy and society.

Training the space skills pipeline

UK universities deliver a range of space-related degree programmes that form foundational skills for the UK space sector, with **136 space-related training opportunities** offered in the UK[57] - crucial to sustaining the labour supply required to grow the sector. At pre-degree level, Further Education (FE) colleges support the space skills pipeline at an earlier stage. Institutions such as Hull College, Alton College, and Loughborough College provide vocational space-related training aligned to space-related careers. For example, in 2023, Alton College secured £500k from the Local Skills Improvement Fund to deliver a Space Skills Hub - raising the profile of the sector to students and helping to diversify the talent pool entering space-related higher education and industry.[58]

Universities also partner with industry to offer degree apprenticeships, with the UK's first space-specific degree apprenticeship launched by the University of Portsmouth and BAE Systems in 2024, with additional apprenticeships (e.g. in engineering and aerospace) offered more widely across the UK.[59] At other research organisations, graduate schemes provide a direct route from education into applied space capabilities. STFC's graduate scheme is a notable example which has supported over 450 graduates, and offers placements at RAL Space, providing hands-on experience of space missions and large-scale R&D projects.[60] Graduates have reported the scheme as key in enhancing technical skills in space and electronic systems, alongside building exposure to mission project management.[60] These programmes support advanced skills development and help to retain graduates within the UK, with STFC noting many graduates remain employed at STFC upon completion of the programme, while others transition into roles across the space sector and wider industry, delivering wider economic and societal value.[60]

Doctoral training and continuing professional development

Centres for Doctoral Training (CDTs) help address advanced skills gaps identified by the UK space sector. These centres provide structured doctoral training combined with industry engagement. Across all fields, decades of UK labour force survey data indicate a wage premia associated with PhD-level education, earning £2-£3 more per hour than Master's graduates, reflecting their contribution to high-value, managerial and specialist roles.[61] CDTs such as the Centre for Satellite Data in Environmental Science (SENSE) – a collaboration between several organisations, including the University of Edinburgh and the University of Leeds, and the University of Surrey's CDT in Future Open Secure Networks (FORT) help strengthen national capabilities in space-related areas, such as EO data applications and secure communications.[62, 63] By producing highly skilled doctoral researchers, these centres contribute to the pipeline of talent that supports mission delivery, drives innovation and enhances the long-term competitiveness of UK space capabilities.

However, skills and recruitment gaps persist and evolve throughout the space sector, especially for mid-career level roles.[64] Continuing professional development (CPD) courses

are therefore essential to sustain workforce capability. Universities including Imperial College, Portsmouth, the Open University, and Leicester deliver space-specific CPDs for continual upskilling, supporting productivity growth by enabling the sector to adapt to technological change and evolving skills needs.

The University of Portsmouth delivered a mid-career CPD programme between 2024 and 2025, funded by the UK Space Agency, training 59 professionals from 11 companies in space software, AI and data science. The programme generated measurable impact, as highlighted by a small early-stage evaluation: 50% of delegates secured promotions or pay increases (averaging 8%), employers created 12 new roles and safeguarded three more, and one firm attributed 30% of a £225,000 contract to the CPD. With impacts still unfolding, this suggests consistent CPD funding could bring significant benefits. Independent evaluation estimated a total net economic impact of £1.5m over three years - a £3.80 return for every £1 invested,[56] showing targeted university-led CPD catalysing productivity gains, contract wins and economic growth.

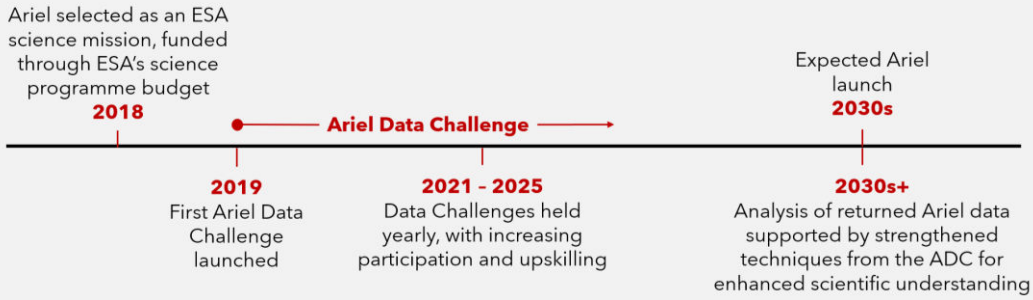
Ariel Data Challenge: building the pipeline of AI expertise for exoplanet characterisation

The ESA Ariel mission is funded through ESA's space science budget, and the UK Space Agency has committed **£30.3m** (as of May 2025) to secure leading science and engineering roles for the UK. Ariel will analyse the atmospheres of exoplanets, and to increase scientific preparedness for the upcoming researchers at King's College London, UCL, and Cardiff University have established the Ariel Data Challenge (ADC). The ADC is an ongoing initiative aimed at training AI and Machine Learning (ML) researchers from academia and industry to construct innovative models to **extract exoplanet signals from simulated observations**, through a competition-based system. In doing so, the ADC aims to strengthen applications of AI / ML techniques to strengthen future scientific exploitation of Ariel mission data. Having run for five iterations, the ADC has reached at least 77 countries and has created one of the world's largest exo-atmospheric science databases, helping to raise the global profile of the Ariel mission. The challenge is mostly run through in-kind contributions, but has received around £113k in financial support and sponsorship money across the last 5 editions

Source: Ariel Data Challenge Promotional Materials

The ADC has grown significantly in recent years, with 200 submissions in the 2022 edition, rising to over 23,000 in 2024. A key reason for this growth is the partnership developed with Kaggle – Google's AI and Machine Learning platform – which not only raised the visibility of the challenge but also provided $50,000 in prize money for participants, increasing incentives to participate. While the benefits of the ADC are global, the UK-based team has supplemented challenges with in-person 'hackathon' events, including in Harwell and London. These events provided students with key techniques required to correct stellar spots in light curves using AI / ML and listen to guest speakers, e.g. the Ariel PI, Professor Giovanna Tinetti (King's College London). All participants reported learning something new, and 94% were interested in attending a future event.[65]

The challenge has successfully attracted industry, with data science company ML Analytics - who won the 2021 edition - now working as an ESA Contractor on ML operation systems relevant to the Ariel Mission, working actively with researchers at King's College London.



Long term capability development

Sustained academic involvement in space missions builds organisational knowledge and national capability that can take decades to develop and cannot be recreated easily. Key examples of capability lineage include the University of Oxford's involvement from Cassini (1997) to Galileo (2003), Imperial College London's progression from mission roles on Rosetta (2004) to Comet Interceptor (planned launch 2028-2029), and Cardiff University's involvement in Herschel (2009) through to Ariel (planned launch 2031). This continuity preserves specialist skills, deep mission experience and technical know-how, ensuring the UK retains and develops the expertise needed to deliver complex missions.

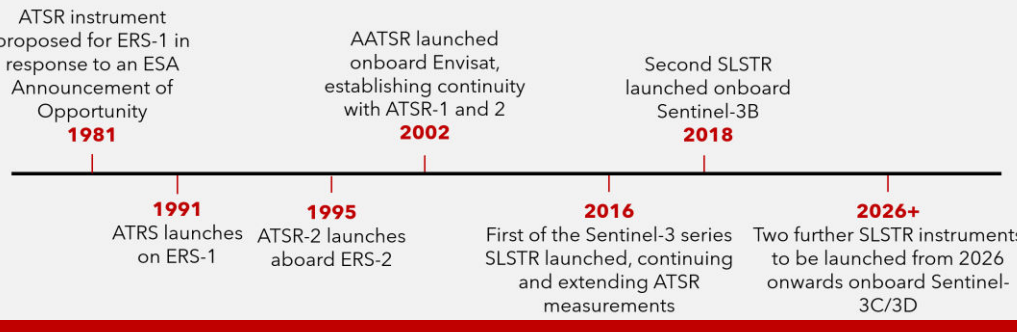
ATSR case study: building decades of UK EO instrumentation expertise through missions

Source: eoPortal Website

UK academia played a central role in developing the Along Track Scanning Radiometer (ATSR) for ESA's European Remote Sensing Satellite-1 (ERS-1). As **ESA's first environmental monitoring satellite**, ERS-1 (launched in 1991) marked a major step in Europe's EO capabilities, and the UK's role in shaping high quality, reliable space-derived climate data that followed. The ATSR instrument was co-funded by the (former) UK Department of Energy and Climate Change and Australia. RAL Space, as prime contractor for the ATSR instrument, along with the University of Oxford, the Met Office, and UCL, positioned themselves and the UK as leaders in high-accuracy TIR imaging, creating core capabilities in sea surface temperature measuring, climate monitoring, marine safety and environmental policy.

The ATSR instrument required significant advances in thermal infrared optics, calibration techniques and instrument design. Success on ERS-1 and following ERS-2 positioned RAL Space as a key supplier for future EO missions. This capability evolved through the Advanced ATSR (AATSR) on ESA's Envisat mission and the Sea and Land Surface Temperature Radiometer (SLSTR) onboard Sentinel-3, each deepening the UK's technical heritage in thermal infrared technology. This ensured that UK expertise fed into the world's most accurate long-term climate records, supporting essential climate modelling, weather prediction and global carbon-cycle analysis.

By continuing expertise through several missions, RAL Space grew and sustained national capability that gives the organisation a competitive edge globally. The decades-long pipeline also highlights how individual researchers contribute to long-term organisational strength. For example, Christopher Mutlow, who joined RAL Space during the early ATSR development, worked across successive instruments and later became Director of RAL Space, exemplifying how alongside technical expertise, mission involvement develops high-level and leadership and management skills within the UK.



4.4 Competitiveness & reputation

The strength of the UK's academic space research base is a driver of the UK's competitiveness and reputation as a leading space nation, with impacts extending beyond research communities to industrial growth, public service provision and wider socio-economic benefits. Academic **leadership in high-profile international research programmes and global policy discussions** position the UK as a credible, trusted and influential space nation. This reputation underpins the UK's ability to attract and retain global talent, secure international research funding, and catalyse inward investment.

UK leadership roles in space research and policy

UK researchers hold key leadership roles across international space science, governance and advisory bodies, extending the UK's influence over global strategic priorities regarding space and investment decisions. These roles enhance the UK research base's reputation to support the shaping of global norms that directly affect market access, operational costs and sustainability of space-based services upon which the UK economy relies.

While this is a non-comprehensive list, UK space researchers have progressed to highly influential roles across the global space sector. Examples include Carole Mundel, Director of Science at ESA, Nicola Fox, Associate Administrator for NASA's Science Mission Directorate, Caroline Harper, Head of Space Science at the UK Space Agency, and Aarti Holla-Maini, Director of the United Nations Office for Outer Space Affairs, all of whom trained and/or held research positions at UK universities.

Source: Anushka Sharma X post

Professor Brian Cox (University of Manchester) serves as the United Nations (UN) Champion for Space, contributing to global advocacy regarding the societal value of space science, reinforcing public and political support for continued space investment.[66] Other prominent positions include: Chris Rapley (UCL), Chair of ESSC, Emma Bunce (Leicester), ESA SSAC, and Mario Bisi (RAL Space) COSPAR Panel on Space Weather Chair.

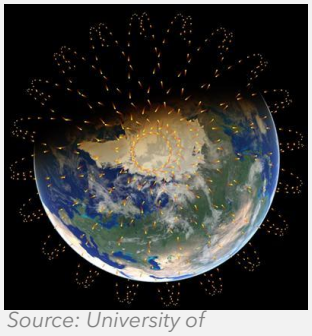
While a subset of the UK space researchers representing the UK internationally, these roles highlight how academics reinforce the UK's international standing while directly influencing decision-making in the global space sector.

The UK's academic standing within space is reinforced by hosting two of the world's top five universities in physics and astronomy – the University of Oxford and the University of Cambridge.[67] This is an example of sustained excellence within the space-skills pipeline and related industries. This expertise strengthens the UK's capacity to develop, operate and leverage space systems that support downstream services such as telecommunications and EO for climate monitoring, helping to deliver wider benefits to UK economy and society.

DAMAGE/RENEGADE case study modelling the future of global space sustainability

Source: Hugh Lewis' Youtube Channel

Prof. Hugh Lewis developed the **Debris Analysis and Monitoring Architecture for Geosynchronous Environment** (DAMAGE) model at the University of Southampton, repurposed as the RENEGADE model in 2025 following his move to the University of Birmingham. It has supported the UK to become a leading global contributor to space sustainability discussions. Since 2003, Prof. Lewis has represented the UK on the **Inter-Agency Space Debris Coordination Committee** (IADC). The UK Space Agency currently chairs the IADC, leveraging the RENEGADE model to inform discussions. The model's development originally began in 1999, funded by the EPSRC.

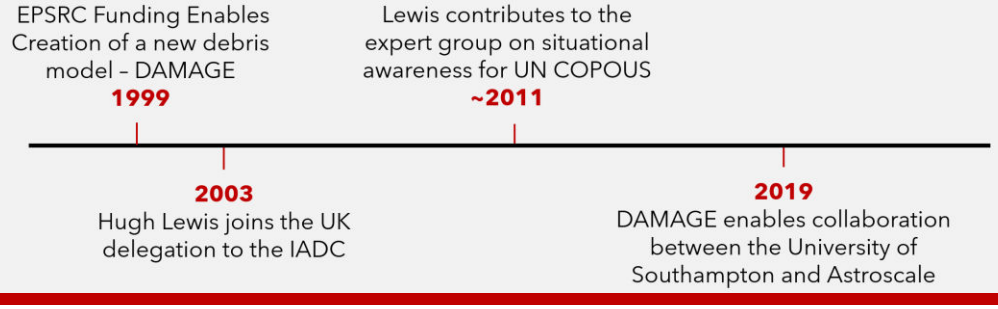


Source: University of Southampton Website

RENEGADE models the long-term evolution of the space environment to support safer and more informed use of orbit, helping to protect space infrastructure that life on Earth relies upon, such as navigation and communications. Leveraging the model, Prof. Lewis has also contributed to expert groups for the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), where DAMAGE/RENEGADE has informed discussions on UN debris mitigation guidelines. This evidence-based input helps shape global norms to reduce the likelihood of debris collisions, enhancing the resilience of space-dependent economic activity.

DAMAGE was one of the first evolutionary 'sandbox' models capable of simulating how large constellations and debris mitigation strategies would affect the orbital environment. It remains one of 15 comparable models worldwide, reinforcing Prof. Lewis' role as a trusted provider of analytical tools used by international regulatory bodies. The model informed technical updates to the IADC Space Debris Mitigations Guidelines, helping to minimise debris impacts from large constellations, essential for the long-term use of space assets, and the terrestrial benefits they support.[68] This demonstrates academic capabilities supporting international consensus on approaches to a sustainable orbital environment.

The model has also supported internationally collaborative projects, including with ESA and CNR Italy, helping partners assess long-term debris risks for increased sustainability of missions. This enhances the reliability of space-dependent services and de-risks missions. The model has also supported operators such as Astroscale and OneWeb in constellation-design strategy, disposal plans and assessment of Active Debris Removal business cases.[69, 70] This helps operators reduce operational risk, extend satellite lifetimes, and strengthen business models, enhancing on-ground services and resultant socio-economic benefits alongside UK industrial competitiveness.



International partnerships and networks

International collaboration is a key mechanism through which the UK space academic base enhances UK reputation and competitiveness. Through ESA, UK **researchers routinely work within multinational consortia, building networks that increase visibility, trust, and access to future opportunities**. These collaborations often lead to follow-on projects, technology transfer, and entry into new markets for UK organisations. Through PI and co-PI roles, UK researchers can shape international research objectives and data use pathways more explicitly to UK priorities, such as climate policy or economic resilience.

Beyond ESA, UK researchers collaborate through bilateral programmes, such as the UK Space Agency International Bilateral Fund (IBF). Under Call 1 of the IBF, 34 UK academic institutions participated in projects with international partners, strengthening relationships, enabling knowledge exchange, catalysing follow-on mission activity and supporting the creation of a spin-out company.[71] The UK Space Agency's Space Science and Exploration Bilateral programme has further integrated UK academic expertise with global projects, including projects with NASA, ISRO, the Japanese Aerospace Exploration Agency (JAXA) and the Canadian Space Agency (CSA).[72] These partnerships enhance the UK's reputation while integrating UK-developed capabilities into missions investigating ambitious exploration, such as sustained human activity on other planets.

Heriot-Watt University: enhancing global reputation through collaboration

Source: Heriot-Watt University Website

Heriot-Watt University is strengthening its global competitiveness and reputation, particularly in space-based quantum communications. Key to this approach is the **Quantum Communications Hub Optical Ground Station** (HOGS) in Edinburgh, a £2.5m facility that opened in 2025. HOGS enabled the university to participate in Canada's QEYSAT mission, where they are collaborating with Honeywell and University of Waterloo to enable a secure satellite link between the UK and Canada. The mission will demonstrate quantum key distribution (QKD) via satellite, helping develop ultra-secure communications channels capable of protecting government, financial and commercial data from threats. This has strengthened industry links with organisations such as Honeywell, opening pathways for collaboration in operational secure communications. Heriot-Watt's reputation is further reinforced through collaborations with major space agencies. University researchers are working with ESA and NASA, including a project with NASA's Jet Propulsion Laboratory for specialist detector technologies.

Source: Niparo LinkedIn

The university is also enhancing its visibility through acting as a convenor for the sub-sector. In May 2025 the university hosted the Niparo Summit on Space Sustainability, which hosted experts in **space law, insurance, regulation and policy**, including the UK Space Agency and ESA.[73] The event was attributed with increasing perceptions of the university. By convening policymakers and industry leaders, academia is shaping shared approaches to sustainable operations and supporting the long-term safety of the space environment on which critical services depend.

4.5 Policy, licensing & regulation

Academic research and expertise contribute to the **development of space-related policy, regulatory frameworks, and governance at both national and international levels**. This includes informing licensing practices, safety standards, sustainability measures and international norms in an increasingly congested and commercialised space environment. Beyond regulation of the space sector itself, academic research also underpins the use of space-derived data to address global challenges. Academic input supports evidence-based policymaking on topics such as climate change, disaster response and security, **helping ensure that regulation remains effective, proportionate, and future-facing**.

Enabling sustainable and responsible use of space

Models and research are also enabling innovative approaches to space regulation. The University of Birmingham's space debris environment model has been leveraged by the UK Space Agency to support its role chairing the Inter-Agency Space Debris Coordination Committee (IADC).[74, 75] This activity is supporting internationally collaborative decision-making on orbital sustainability. Continued development of this work at the University of Birmingham is strengthening the UK's ability to influence global mitigation strategies – described in more detail in the case study under *Section 4.5*. The University of Strathclyde is also investigating the environmental sustainability of future missions, with the lead researcher serving on the UK delegation to the IADC.[76] Through the UK-led Earth Space Sustainability Initiative (ESSI), multidisciplinary UK researchers are supporting space sustainability efforts. With a Memorandum of Principles signed by over 100 organisations, the group is progressing formal standards for space.[77] Together, these activities support **international consensus on debris mitigation, reducing long-term collision risk and protecting space system upon which space-enabled services depend**.

Other research supporting space sustainability sits at the cross-section of atmospheric science and end-of-life disposal of space assets. Atmospheric ablation research led by the Universities of Durham, Leeds and Southampton shaped policy discussions on satellite end-of-life disposal, including at UNOOSA, UNEP, and the Summit for Space Sustainability.[78] Influence in this field is an example of the UK's ability to shape global space activities to UK interests, protecting the UK and its values, and safeguarding socio-economic benefit on the ground. Leading research on space sustainability informs the protection of space as a common good and ensures future generations can continue to leverage space.

Academic expertise supports policy through contributing to parliamentary evidence, with (for example) 13 individuals from UK research organisations contributing to the 2025 House of Lords UK Engagement with Space Committee.[79] The resulting recommendations are now informing government discussions on policy reform to strengthen the UK space sector, supporting economic growth and strategic UK capability enhancement. Academics also fed into the UK's 2024 Space Regulatory Review, informing assessments of regulatory gaps and opportunities to modernise licensing frameworks.[80] This supports a UK regulatory environment that enables innovation while maintaining high safety and sustainability standards, and enhances the UK's reputation as a responsible space actor, supporting inward investment and industrial growth.

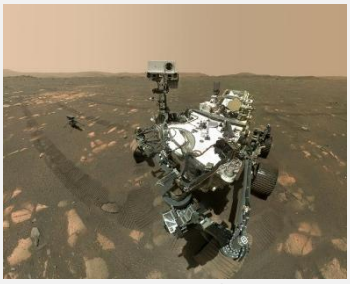
Social science researchers are increasingly applying interdisciplinary methods to space, generating bodies of work on space regulation, legal and liability frameworks, and the ethical and societal impacts of launch activities. This includes stress-testing standards for new applications, as the boundaries of space capabilities continue to be pushed. For example, the University of Northumbria is supporting policy development on the ethical and community impacts of UK spaceports, informing discussions regarding responsible

launch regulation, while a UCL project - *Ethnography of an extra-terrestrial society: the International Space Station* - investigates cooperation and daily activities in space.[81, 82]

Academics also contribute to technical standards, directly shaping regulations and licensing. For example, a University of Dundee professor contributed significantly to the SpaceWire standard document (ECSS-E-ST-50-12C) under the European Cooperation for Space Standardization.[83] This document defines protocols for data handling between spacecraft subsystems, ensuring that components built by different organisations can operate reliably within a single spacecraft. By underpinning interoperability and reducing integration risks, the standard supports **safer, more cost-effective spacecraft development**. UK academic expertise therefore directly influences the reliability of satellites and the downstream services they enable, from navigation to communications.

AstrobiologyOU: shaping the rules of space exploration

The Open University's AstrobiologyOU is an interdisciplinary research group that sits at the cross-section of science, engineering, ethics and governance. Alongside support from internal funding, the research group secured **£6.7m** from Research England, enabling its expansion.[84] Its work shapes national and international **planetary protection policies**, ensuring space exploration does not contaminate other planets. These activities position the group as early global leaders in regulation for space missions, with OU researchers noting that the UK's approach is globally recognised best practice.



Source: NASA JPL Website

AstrobiologyOU researchers hold **influential international roles through the Committee on Space Research (COSPAR)**, where researchers represent the UK on the COSPAR Panel of Planetary Protection and lead working groups, including the Mars subcommittee, positioning the group at the forefront of regulatory discussion for upcoming Mars missions. AstrobiologyOU researchers were crucial in shaping the creation of the UK Planetary Protection Advisory Panel, ensuring UK activities are aligned with the UN Outer Space Treaty. This supports the long-term viability of space exploration and protects investments in future missions.

Source: COSPAR Website

Through COSPAR, the group collaborates with **10+ space agencies**, including NASA, ESA and the Indian Space Research Organisation (ISRO), with the UK playing an important convening role. In 2024, as part of their £1.05m UK Space Agency International Bilateral Fund project, the Open University hosted the Inaugural International COSPAR Planetary Protection Week, bringing together policy makers, scientists, and delegates from 24 countries. The event demonstrated UK academia's ability to act as a platform for global dialogue, facilitating otherwise unlikely multinational discussions. This form of science diplomacy supports policy alignment across major space actors (including the USA, China, India and Europe) and reduces regulatory friction for mars and lunar missions.

AstrobiologyOU also leads UK efforts, alongside Imperial College, to modernise planetary protection regulations, shifting toward evidence-based and cost-effective probabilistic risk assessment. Their research on contamination modelling aims to provide missions with cost-effective, scientifically robust approaches that maintain safety while minimising barriers to exploration efforts. This helps to improve mission efficiency, reduce compliance costs for organisations and strengthen the UK's attractiveness as a partner in future missions.

Informing policy and decision-making on Earth

Beyond regulation for the space environment, UK academics are a core provider of data to inform policymaking to address societal challenges on Earth. For example, EO is a key capability area in which academic research informs environmental management, climate change, public health and security, **supporting efforts to meet UN Sustainable Development Goals**.[85] There are 55 globally agreed Essential Climate Variables (ECVs), 26 of which can only be monitored through EO Satellites.[86] Within the ESA Climate Change Initiative, the ESA Biomass consortium, which is managed by researchers at Aberystwyth University with the University of Sheffield leading the science, plays a central role in monitoring global forests.[87] Biomass observations are a crucial aspect in understanding global carbon stocks, which underpin efforts to track and model climate change, with data being increasingly integrated with national forest-mapping systems to meet the monitoring requirements of the Global Stocktake under the Paris Agreement.[88] These efforts are spearheaded by UK academia, demonstrating the role of UK research in shaping global strategies to tackle emissions and assess progress against climate commitments.

UK researchers also contribute to the Paris Agreement through involvement in other missions. NPL, RAL Space, the University of Edinburgh and the University of Leicester are amongst the academic institutions contributing to the UK Space Agency-CNES Microcarb mission (launched in 2025), which will verify reductions in CO_2 emissions in response to Paris Agreement commitments and UK net zero targets.[89] Collaborative initiatives such as Space4Climate, which is closely linked to the University of Reading, further demonstrate how **academic expertise feeds directly into international policy processes**, including involvement in the 2025 United Nations Climate Change Conference (COP30).[90] Outputs from the research network directly translate space-based evidence into societal and environmental decision making.

UK researchers also contribute to **natural hazard preparedness and disaster risk reduction**. For example, the University of Leeds is leveraging Sentinel-1 InSAR data to assess volcanic inflation prior to eruptions, enhancing early warning and preparedness.[91] Similar EO-based approaches are used for flood-risk assessment, landslide monitoring, and extreme weather analysis. The potential for damage cost reductions here is significant, with flooding alone estimated to cause £2.4bn in the UK each year.[92] These activities are a subset of wide-ranging activity by UK academics providing evidence to underpin global climate accountability and natural-hazard preparedness, directly informing UN climate processes, responses to the Paris Agreement, and global disaster risk reduction to reduce societal and economic damages.

4.6 Defence, security & resilience

Academic research underpins critical aspects of the UK's defence, security and national resilience relating to these assets, through contributions to **space situational awareness, EO for security and crisis response, space weather research, and space sustainability.** More than 90% of the platforms and systems that constitute UK military equipment are dependent on space to some extent, including both UK-owned and international space assets.[93] By providing technical expertise and cutting-edge technologies, academia enhances resilience to natural, technological, and geopolitical risks, while operating within established ethical and legal frameworks. The Defence and Security Industrial Strategy identifies space as a critical domain for national security and economic resilience.[94] These activities represent a subset of the wider academic research and activities strengthening the UK's resilience in space and space-dependent infrastructure, protecting economic activity.

Space as part of the UK's critical national infrastructure

Space systems are recognised as part of the UK's critical national infrastructure,[95] with academic research supporting the continuity of everyday economic activity and public services. By preventing service outages in space systems, the cascading potential impacts across sectors such as energy, transport, finance and communications are minimised.

UK research organisations provide **essential modelling and forecasting expertise for national services**. The Met Office's upper-atmosphere space weather modelling suite was built at the University of Birmingham, in collaboration with Universities of Leeds, Bath, Leicester and Lancaster.[96] These universities contributed key components that enable the Met Office Space Weather Operations Centre (MOSWOC) to forecast impacts. MOSWOC also feeds information into the UK National Space Operations Centre (NSpOC) for the centre to deliver timely warnings, affecting government awareness, infrastructure protection, and public-facing alerting. The service improves early warning and risk assessment of weather events that could disrupt satellites, GNSS and power infrastructure (with potential multi-billion-pound damages).[33] Consequently, these activities aid government and operators to plan cost-effective mitigations, reducing the risk of high-impact service outages and lowering recovery costs. The previously mentioned ESA Vigil mission, featuring instrument contributions from Imperial and UCL, will directly address hazards identified in the UK National Risk register, improving preparedness defence, emergency response and civilian infrastructure, reducing the risk of critical service interference – and associated substantial socio-economic impacts - on Earth.[97]

Beyond space weather, UK researchers support a broad range of security and resilience-related space capabilities. For example, the University of Strathclyde's research on AI-enabled space debris detection and mitigation enhances space situational awareness (SSA) and collision avoidance capabilities.[98] Reducing collision risk protects high-value satellites, **avoids the costs of service loss and preserves the orbital environment for long-term use**. The university (and many other UK organisations) also contributes to research across space weather resilience and quantum technologies, further strengthening their contributions to enhancing the robustness of space systems against natural threats.[99]

The dual-use nature of space research

Many capability areas, such as EO, satellite communications, and positioning, navigation and timing (PNT), are inherently dual-use. Academic research in these domains delivers civil benefits while simultaneously strengthening defence and security capabilities, maximising returns on investment.

EO capabilities developed by National Centre of Earth Observation (NCEO) affiliated researchers contribute to maritime security through applications such as illegal fishing detection and shipping route monitoring. These capabilities are also used to support border security and disaster response. UK space academia helps protect economic assets, strengthen law enforcement, and enable efficient allocation of public resources.

The importance of academic contributions to defence and security activities is reflected in targeted funding that accelerates the transition of academic innovation into operational UK defence capabilities. 5 UK universities have been awarded DASA funding across 3 rounds of the *Space to Innovate Campaign*, supporting research into resilient space systems.[100]

Quantum technologies are another area where UK researchers are delivering civilian innovation with defence relevance. **£24m has been invested into the university-led UK Quantum Communications Hub**, bringing together 8 universities and 13 companies to advance secure communications technologies.[101] This includes research into satellite-based quantum key distribution, enhancing secure communications for civilian uses, such as

transferring sensitive data in finance and healthcare, while also supporting highly secure defence and government communications. This dual-use pathway strengthens national security while advancing UK competitiveness within a strategically important sector.

University of Strathclyde: research across capability areas applicable to UK security

The University of Strathclyde illustrates how academic research directly contributes to the UK's national security and resilience. Its space-relevant research spans **SSA, space weather resilience, and secure satellite communications**. These capabilities underpin the safe operation of spacecraft and protect space-dependent services.

The University undertook a **£1.5m** project funded through the UK Space Agency's International Bilateral Fund in 2023, applying machine learning to predict the movement of space objects and enhancing the UK's ability to monitor an increasingly congested orbital environment, reducing collision risk and supporting safer operations in orbit.[98] This helps protect satellites that provides services to defence, government and public end users. The project is also supporting the creation of The Institute on AI for Space Sustainability, positioning the UK as a hub for global SDA research, supporting a growing provision of critical orbital environment information to support growing civil and defence reliance on space systems.

Source: The Institute on AI for Space Sustainability Website

Quantum technologies are another key route through which Strathclyde is contributing to national resilience. Researchers are leveraging quantum technology for space weather monitoring and have deployed five new quantum magnetometers across the UK, significantly expanding coverage of space weather monitoring capabilities.[99] This enhances the UK's ability to anticipate and prepare for disruptive space weather events, minimising interruptions to space-enabled services.

Source: University of Strathclyde Website

The university is also helping to advance the UK's secure communications network through a **£250k** UK Space Agency-funded project, designing Micro LEDs for Satellite Quantum Key Distribution.[102] Working in collaboration with the University of Bristol through the UK's Quantum Communications Hub, Strathclyde is contributing to secure communication channels which can protect sensitive data and reduce vulnerabilities to cyber-security threats, enhancing the resilience of government, defence and critical economic sectors.

5. Risks

The ability of the UK's space academic base to continue generating the breadth and depth of impacts discussed in this study is not guaranteed, and there are several potential risk factors identified during the study to the long-term benefits of the UK space research base.

Uncertainty in long-term funding

UK roles in space science missions (for example, Gaia) illustrate how **routes to impact within the space sector can take decades to fully materialise**, reinforcing the need for long-term funding certainty. Correspondingly, these capabilities can be lost quickly without funded research opportunities. Evidence from the academic community has highlighted this, emphasising the need for long-term, strategic investment to retain expertise for the

timelines required for space missions.[103] We repeatedly heard how short-term funding cycles and limited fellowship opportunities can accelerate the loss of scientific talent and crucial technical expertise, often to overseas programmes.[104]

Uncertainty around future funding is a critical risk. Flows of funding sustain research, instrumentation development, mission leadership, space-derived service provision, and support the skills pipeline. However, shifts in public budgets and ambiguity around funding over long time horizons introduce instability in long-term planning. For example, UKRI's announcement on February 1st 2026 stated that "in order to remain sustainable, STFC must make significant cumulative savings".[105] A letter from the STFC Executive Chair, Prof. Michele Dougherty has indicated the budget for particle physics, astronomy and nuclear physics together will drop by around 30%, with other scenarios planned. [106]

Further risks arise from the UK's declining share of ESA's overall budget. UK contributions have fallen from 11% of the total ESA budget (in 2022) to 8% (in 2025).[107] While these figures represent an overall share – with the UK's contribution varying across programmes, a sustained decline risks reducing UK access to mission leadership roles and the associated scientific and industrial returns, due to geo-return principles. While national programmes are another key funding source which must also be considered, the implications of UK funding commitments to space research should be closely monitored.

UK parliamentary evidence across human spaceflight, planetary science, EO and space instrumentation has also highlighted that a **lack of sustained mission participation leads to the erosion of specialist skills**, with witnesses warning that once these capabilities are lost, they are extremely difficult to rebuild.[108] Changes in, or a lack of, funding can interrupt projects and disperse talent, which can lead to capability losses that are difficult to reinstate as global research continues to advance. For example, public cuts to research or cluster funding may jeopardise the ability of UK research organisations to deliver globally competitive research, skills and training, and regional ecosystem development for to support economic growth in the sector.

Challenges within universities

A related risk concerns the financial sustainability of universities themselves, including pressures that may lead to restructuring or making specialist staff redundant. These could lead to the **existential and permanent loss of areas of key expertise, technical teams and research capabilities** that underpin the UK's role in international space activities. Again, once lost, these capabilities can be difficult and costly to rebuild, potentially creating gaps in the UK's national research base.

Management of intellectual property and commercialisation within universities can also constrain the ability of the academic base to translate research into industrial and societal outcomes. **Commercialisation pathways across universities are uneven**, with some universities well-versed in technology transfer with strong links to private capital, while others have less operational expertise and weaker investor networks to support commercialisation. This can contribute to regional disparities in realised economic impact from the space academic base, with knock-on effects for regional clusters and national competitiveness.

Constrained commercialisation pathways also feed into the **wider risk of the knowledge generated within academia remaining under-utilised**. The study illustrates how UK researchers contribute to the space sector and wider society through critical missions, programmes and global policy discussions. However, these strengths rely on effective mechanisms for uptake of research into applied activities. Without these, the UK's academic foundation risks being under-utilised and limits translation into end-user impact. Stakeholders mentioned some of academia's relatively low engagement with established

knowledge transfer mechanisms, such as the Innovate UK Knowledge Transfer Partnership (KTP) programme, could further this risk. Limited opportunities or awareness to uptake these mechanisms can limit the translation of academic research into commercial products and services that produce economic and societal benefits.

Challenges in coordination and strategic planning

As outlined in *Section 2.1*, coordination bodies such as SPAN and SUN play a critical role in translating the UK's distributed research base into cohesive national voice. **However, this coordination layer remains fragile**. SPAN's capacity is constrained by limited budgets, and beyond these bodies there are few mechanisms through which academia can identify shared priorities or advocate collectively for sustained support. Much of the data needed to inform strategic planning across the research base does not currently exist in a systematic form. Without improved coordination and evidence, the sector's ability to respond to emerging opportunities and threats, including those affecting commercialisation pathways and regional ecosystems, could be diminished.

6. Discussion

This study identifies **112 UK organisations undertaking space-related research, employing over 5,200 researchers across every UK region and Devolved Administration (DA)** and spanning all nine capability areas examined. This breadth demonstrates that the UK's space research base is a truly national asset, covering disciplines from space science and EO to emerging areas such as space law, economics and ethics.

Across the major public funding channels, we estimate that **over £260m of competitively-awarded funding flows annually to UK research organisations for space-relevant research**. While this gives a broad indication of magnitude, it is not comprehensive. Other sources, such as quality-related block grant funding, private investment and classified defence spending are not captured. Funding is concentrated in a subset of organisations, skewing geographical distribution. The top four regions/DAs receive two-thirds of competitive UKRI funding – a pattern worth consideration as the sector explores how to best leverage nationally distributed strengths.

Our impact chapter illustrates how **the UK's space academic base is a primary engine through which scientific excellence, economic growth, international influence and strategic resilience are secured for the UK space sector and wider society**. Across each impact theme, universities and research institutions act as enablers of impacts beyond their own organisations, with impacts linked to the long-term evolution of national capabilities, the growth of regional economies, and the global competitiveness of the UK space sector.

The evidence in this report is not a comprehensive account of all activity, though it highlights how academia advances a range of capabilities including space science, instrumentation, quantum, AI applications, policy formation and more. These strengths are shown through tangible outputs such as leadership roles on ESA missions and contribution to globally influential climate records. The UK's extensive involvement across these areas (and cross-sections between them) are underpinned by sustained academic expertise, heritage and capabilities. Many capabilities are inherently dual-use, and space research is central to the development and protection of space as a critical national asset, in turn supporting UK security resilience to natural and geopolitical risks.

The role of academia in supporting national space skills development is foundational. Given two thirds of the space workforce is university educated, universities are essential to meeting current and future skills needs of the sector, which already pose challenges to sector growth. Through degree programmes, doctoral training, apprenticeships and

continuing professional development, universities and research organisations supply talent to the sector, alongside supporting and continuous and evolving upskilling of the existing workforce aligned with industry needs. Many of the highly technical and newly emerging skills required by the sector are being developed within academic settings.

Academia also drives economic growth and commercial innovation. Spin-outs from universities translates R&D into commercial opportunity, job creation and inward investment. Beyond this, **research institutions anchor regional space industry activity as they attract investment, feed skills pipelines, and supply specialist infrastructure and commercialisation support**. Universities are centrally positioned within several space clusters across the UK, providing research and talent, and, in some cases, funding. The value of the space research base extends far beyond scientific discovery – it is a key funnel of innovation and technical expertise upon which the wider UK space sector depends.

Through this study, we have identified several areas for potential further research:

- **Deeper dives into funding** - *e.g. historical GtR records; trends; funding by TRL.*
- **Funding mapping by capability and/or impact area** - *to understand where funding is directed.*
- **Space-adjacent funding streams** - *to provide a better picture of total investment.*
- **Researcher numbers by capability area** - *to strengthen ecosystem analysis.*
- **Researchers by seniority level** - *to understand skills and experience distribution.*
- **Vocational pathway mapping** - *e.g. apprenticeships and further education.*
- **International benchmarking** - *UK comparative SWOT analysis, building off previous a previous RAND / **know.**space study which focused on space science.*[109]
- **Deeper dive into impact areas** – *holistic analysis of each identified impact theme.*
- **Deeper exploration of risk factors** - *for the future impact of space research, e.g. monitoring the UK's evolving ESA contribution share and its downstream effects.*
- **Holistic UK academic spinout analysis** – *to explore role in space sector growth.*
- **National Space Strategy delivery spend** - *Regular study to address lack of comprehensive quantification of total spend and inform key bodies such as DSIT.*
- **Regular landscape and impact assessments** - *to inform collaborative strategic planning and coordination of academic stakeholders in the sector (e.g. SPAN, SUN).*

Technical annex

Mapping the size and nature of the UK's academic landscape

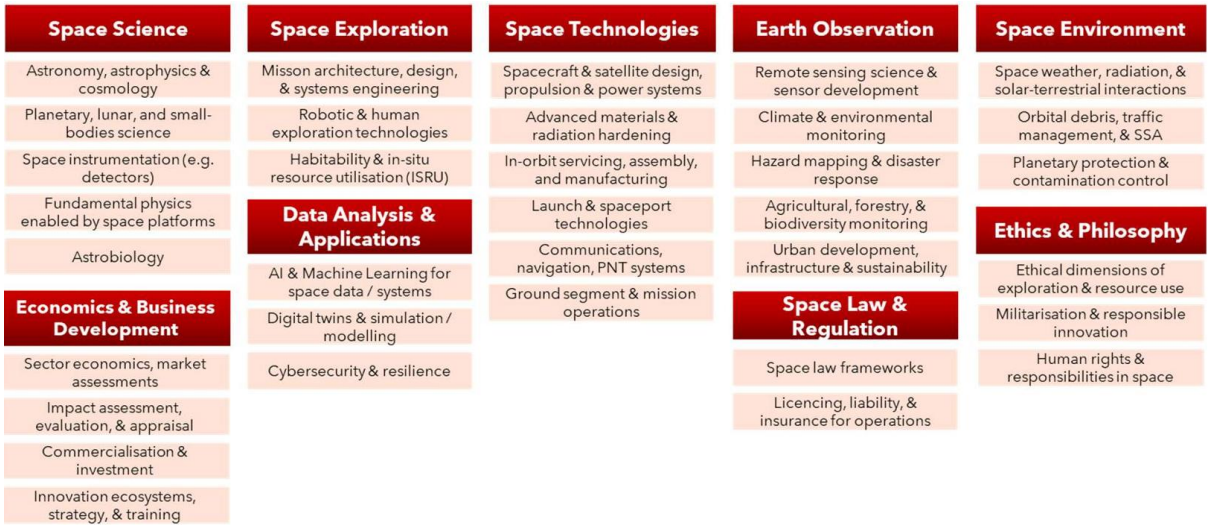
Definitions and scoping

This section sets out the key definitions, scope boundaries, and taxonomies used throughout the study. These definitions underpin both the landscape mapping and funding analysis, and are essential for understanding the study's scope and coverage.

Space capability areas

This study organises UK academic space research activity into to nine capability areas, aligned with the original Request for Quotation (RfQ) for the study. These capability areas provide a consistent framework for classifying organisations, researchers, and funding by research domain. A more detailed breakdown of these areas can be found below.

Figure 12 Overview of capability areas relevant to this study



These capability areas are not mutually exclusive; a single organisation or research project may span multiple areas. The capability areas used in this study are distinct from those defined by the Department for Science, Innovation and Technology.[110] For the purposes of this study, organisations were assigned to applicable capability areas based on their active research portfolio.

Example – Mapping space capability areas

A researcher developing novel AI tools and software integrated with satellite sensors to interpret or process data and imagery would be classified under:

- *Earth Observation*;
- *Data Analysis & Applications*, and;
- *Space Technologies*.

Space-related research

This study applies broad inclusion criteria for space-related research. A research activity may be classified as space-related if it reflects any of the following characteristics:

1. **Space as the primary subject**: Research where the primary object of inquiry is located beyond Earth's atmosphere, such as astrophysics, planetary science, or the study of space environments.
2. **Advancing space systems**: Research that directly advances the design, operation, governance, or scientific exploitation of space systems, including spacecraft engineering, propulsion, mission design, and space policy.
3. **Material reliance on space applications**: Research that depends substantially on space-derived data, infrastructure, or services as essential inputs, such as Earth Observation science, satellite communications research, or GNSS-dependent studies.

As a practical rule of thumb, and consistent with the approach used in the UK Space Agency 'Size and Health of the UK Space Industry' series, research was considered space-related if it would be severely disrupted were space applications to cease functioning. This broad approach is well suited to the complexity of the field, where boundaries between space and adjacent disciplines are often blurred, and was designed to capture the full breadth of research activity relevant to the study's scope.

Adjacent research areas that did not meet the study's inclusion criteria but could be argued to indirectly support the space sector, such as aerospace engineering or general dynamics research, were not included within the study's scope. Such areas could be explored in future work to provide a broader view of the research base supporting UK space activities.

Research organisations

This study defines a "space research organisation" as a non-commercial organisation that secures income through grant funding, core funding, research funding, tuition fees, departmental expenditures, or operating budgets, and that actively conducts research and development applicable to at least one of the space capability areas defined above. Inclusion was determined by intrinsic academic activity, core objectives, funding model, and organisational role.

Organisations that work closely with universities but whose primary activities lie outside academic research, such as Catapult centres or operational agencies, were excluded from detailed analysis, though their relationships with universities were referenced in the report narrative when relevant. Organisations functioning as extensions of university research activity, e.g. key groups, panels and committees were also excluded, though referenced.

The study drew primarily on the official list of research organisations eligible for UKRI funding as an authoritative and standardised source.[111] This register provides a verified census of UK institutions with the regulatory approval and infrastructure to conduct high-level research, offering a consistent baseline for the study. The register classifies organisations into distinct categories, of which three were identified as applicable to the study's scope:

- **Universities:** Academic organisations conducting research alongside teaching activities. The list of universities was drawn from the Universities UK official membership list,[112] which provides a consistent baseline of research-active, autonomous, and publicly accountable universities across the country.
- **Independent Research Organisations (IROs):** Research-focused bodies that operate independently of universities but conduct academic-style research. Examples include the Alan Turing Institute and the National Physical Laboratory.

- **Research Council Institutes (RCIs):** Specialised laboratories and research facilities operated directly by UK Research Councils, typically focused on providing national research infrastructure and capabilities that complement university-based research. Examples include RAL Space within the Science and Technology Facilities Council.

The study remained open to organisations not listed on the UKRI register but clearly applicable to the study's scope.

The landscape and funding mapping elements of the study also excluded organisations whose activities are primarily commercial, or training-only providers, and operational agencies. Space-relevant examples include Further Education Colleges, Natural Environment Research Council centres, the Met Office, and academic spinout companies. These exclusions ensure the study remains focused on academic research activity rather than adjacent or translational functions. The impact chapter does however reference work of some of these organisations, where relevant for the section in question.

Researchers

For the purposes of this study, a researcher is defined as an individual **actively engaged in space-related research** and employed by an organisation within scope. Consistent with internationally recognised standards, including the OECD Frascati Manual (2015) and the UNESCO Institute for Statistics researcher seniority classifications (2019),[113, 114] the study applied a minimum threshold of postdoctoral status to ensure that individuals counted are conducting independent research activity. Administrative staff, technical support personnel, and those in purely teaching roles were excluded.

For UKRI laboratories and other research institutes, the study included active researchers with role titles indicating research responsibilities (e.g. Researcher, Research Scientist, Research Fellow). This approach ensures broad comparability across universities, UKRI bodies, and non-university research institutes, and provides consistent inclusion rules suitable for desk-based research, as the criteria rely on common job-title keywords and standardised role descriptions.

Landscape mapping

This section describes the step-by-step methodology used to identify and characterise UK research organisations actively engaged in space-related research. The approach followed a structured, multi-stage process of systematic desk-based research (DBR), drawing on publicly available sources to identify relevant organisations, research units, projects, and activities.

Large language model (LLM) tools were also used as a supporting input during this process. These tools assisted with initial exploration of less accessible information, provided contextual background to inform research directions, and supported the development of preliminary estimates where data was limited, as well as data processing. We manually reviewed and validated AI-generated outputs to ensure accuracy and consistency, recognising the potential for errors or misclassification in automated outputs.

Identifying space-relevant research organisations

The first step was to conduct a systematic review of every research organisation to identify those engaged in active space-research. Desk-based research was conducted on each organisation's website to identify relevant departments, research units, research themes, interest groups, and publications. Organisations were classified as either space-relevant or not applicable, and the rationale for each decision was documented.

Once applicable research organisations were identified, further research was conducted to capture their geographical information, including postcode and International Territorial Level (ITL) regions (levels 1 and 2). Such classification provided a standardised geographical framework ensuring comparability and consistency across the UK. Each organisation was allocated a single postcode – this could mean, for example, that for multi-campus sites there is some skew in the data. An obvious example would be MSSL researchers (with many based in Dorking, Surrey) being allocated to UCL in central London. This could be refined in further research, with greater resource allowing for deeper analysis at the 'sub-organisational' level.

Estimating research numbers

The next step was to estimate the number of researchers undertaking space-relevant research within each applicable organisation. This involved exploring institutional websites and staff directories, focusing on the research areas identified in the previous step, as well as any additional sources that could provide a comprehensive overview of the organisation's space-related research activity.

Where organisations provided detailed staff listings by research area, counts were taken directly. Where such information was unavailable, assumptions were made using a proportional approach. These proportional estimates were informed by multiple complementary lines of evidence beyond the rule-of-thumb defined in *Section 1*. In particular, the funding analysis (*Section 3*) revealed how space-related research is distributed across adjacent disciplines – for example, large fundamental physics programmes whose abstracts described direct applicability to space. This helped calibrate proportional estimates for organisations where staff listings were incomplete and conservative assumptions were required.

In practice, no single method was applied uniformly; the approach combined the rule-of-thumb, funding-informed insights, and organisation-specific evidence to reach the most realistic estimate in each case. The two workstreams were mutually reinforcing: researcher estimates helped refine the weighted keyword search for GtR projects, while funding data in turn helped calibrate researcher proportions. The resulting figures should thus be interpreted as **best-available approximations rather than precise headcounts**, reflecting the strongest methodology achievable within the study's scope.

Example - Estimating researcher numbers for an organisation

A university's Department of Physics lists three research themes with an estimated 100 researchers across all themes:

- **Astrophysics** (relevant): 100% of one-third of researchers counted = 33 researchers
- **Optics** (partially relevant): 35% of one-third counted = 11 researchers
- **Materials science** (marginally relevant): 20% of one-third counted = 7 researchers

Beyond the most obvious departments, systematic searches were conducted across other areas of the institution to identify potentially applicable researchers. Departments such as Mathematics, Law, Geography, and Management were explored for space-relevant activity. A common example was researchers utilising remote sensing or satellite-derived data across various fields. Continuing the example above:

- **School of Geography** (remote sensing research group): 8 researchers found
- **Department of Mathematics** (orbital mechanics): 4 researchers found
- **School of Law** (space law and policy research): 2 researchers found
- **Business School** (space economics and commercialisation): 1 researcher found

Estimated total for this university: 66 space-related researchers.

The approach applied **conservative assumptions** to partially relevant research areas to avoid overestimation. Rationales for estimations were documented alongside the data. Furthermore, **internal quality assurance** was conducted by know.space team members not involved in the original estimation exercise, checking for consistency, plausibility and alignment with the funding analysis.

In our assessment of researcher numbers, the UK Space Agency's *Size & Health of the UK Space Industry 2024* publication served as a key reference point. To contextualise our findings, we provided a comparison of regional and devolved administration data in *Figure 7*. The first two columns compare the share of researchers identified in this study against the share of space sector employment reported in Size & Health 2024, enabling an assessment of where research activity is clustered relative to broader industry presence. The final two columns present the share and absolute numbers of organisations, providing context on the underlying scale of research and industry presence in each region and devolved administration. Together, this data allows readers to assess both relative research intensity and the underlying size of each region's research and industry base.

Mapping to capability areas

The final step of the process was to map each space-relevant research organisation against the nine space capability areas defined. This was conducted through a combination of manual and LLM-assisted research, drawing on institutional websites and publicly available information. Research projects, programmes, and departmental activities were reviewed to identify all applicable capability areas for each organisation.

Resulting dataset

Upon completion of the landscape mapping exercise, the study was able to produce a **comprehensive dataset of UK research organisations actively engaged in space-related research**. For each organisation, the dataset includes:

- Organisation name and type (University, IRO, or RCI)
- Justification for inclusion as space-relevant
- Geographical information (postcode, ITL1 and ITL2 regions)
- Estimated number of active space-related researchers
- Methodological notes on researcher estimation, where applicable
- All relevant space capability areas

Ultimately, this dataset enabled the analysis of the geographical distribution of space-active research organisations across UK regions and devolved administrations, the distribution of researchers by organisation, organisation type, and region, and the spread of research activity across capability areas.

Funding analysis

As part of the study's scope, high-level analysis was conducted on **funding sources available to the UK space research base**, including interdisciplinary sources, and the magnitude of these flows. Given time and resource constraints, the study leveraged existing data and documentation to map funding pathways, funding challenges, and evidence gaps. As with earlier stages, LLM tools supported the research process throughout, with all AI-generated information verified by analysts.

Approach and data sources

Publicly available information on funding channels to the UK space academic landscape is limited and fragmented. To address this, the study adopted a dual approach: in-depth

analysis of **UKRI's Gateway to Research (GtR)** platform as the primary source, complemented by desk-based research on **other major funding channels**.

UKRI's GtR was selected as the primary data source given its comprehensiveness (over 171,000 projects) and historical depth (dating back to 2006). The platform's detailed project-level information, including funder, recipient, abstract, timeline, and value, enabled systematic analysis of space-related funding flows.

For other funding sources, desk-based research drew on a range of publicly available materials, including:

- UK Space Agency budget allocations, press releases, and programme call documents
- UK Space Agency internal analysis (shared with permission)
- ESA CM25 Document 100
- CORDIS portal for information on Horizon Europe
- EU Multiannual Financial Framework data
- Dstl annual reports
- SPAN Academic View on Future of Space Policy and Funding Whitepaper 2024

This approach enabled estimates across all major funding channels available to space-related research in the UK, while acknowledging the limitations of relying heavily on a subset of platforms for detailed quantitative analysis.

GtR data extraction

The first step was to download the complete GtR dataset, gathering all available research projects into a single dataset for processing. This raw dataset served as the foundation for identifying space-related projects.

Classifying space-related projects

Identifying space-related projects within the GtR dataset is challenging, as there are no space-specific activity codes. The term "space" is inherently ambiguous, appearing across unrelated domains such as architecture, urban planning, and social sciences. Processing over 171,000 projects manually was not feasible, and simple keyword searches would generate unacceptable levels of false positives.

To address this, a **weighted keyword classification system** was developed and implemented in R. The approach assigns scores to projects based on the presence of terms across multiple evidence groups, with different weights reflecting the strength of each term's association with space research.

The classification system employed five keyword groups with assigned weights: **strong space keywords** (weight: 3) for unambiguous terms like "exoplanet", "astrophysics", and "spacecraft"; **moderate space keywords** (weight: 1) for ambiguous terms like "orbit" and "gravity" requiring corroboration from stronger terms; **agency keywords** (weight: 2) and **mission keywords** (weight: 2) for space organisations and specific missions providing contextual validation; and **exclusion keywords** (penalty: -10) to filter false positives such as "architectural" or metaphorical uses of "black hole". Projects reaching a cumulative score of 3 or higher, or containing certain combinations of strong terms, were classified as space-related.

To further filter out false positives, the system identified and excluded projects where space-related terminology appeared in non-space contexts, such as references to "space" in architecture or social research, or terms like "satellite" used metaphorically or in contexts such as “satellite data accounts”. Projects were classified as space-related when they

reached a minimum score threshold, or when certain combinations of strong terms were present.

The resulting dataset was split into two groups: space-relevant projects and non-applicable projects. This separation enabled systematic validation and streamlined data handling for subsequent analysis.

Validation

The classification system was validated through **systematic manual review**. A random sample of 100 projects classified as space-related was reviewed to assess precision (the proportion of identified projects that are genuinely about space research). A separate sample of 100 projects classified as not space-related was reviewed to assess recall (whether genuine space projects were incorrectly excluded).

LLM tools were also used to scan results for outliers and identify potential flaws in the classification logic. The classifier was refined iteratively based on these findings, with multiple iterations conducted until the model achieved satisfactory accuracy. The final version achieved approximately **90% precision for high-confidence classifications**, and **close to 100% recall**, meaning we judge that few genuine space projects were missed. Additionally, projects with the highest funding values were manually reviewed to ensure that any misclassified outliers did not distort the overall findings.

Other funding sources

Beyond UKRI, desk-based research was conducted to estimate funding flows from other major sources, including the UK Space Agency, the European Space Agency (via UK contributions and georeturn mechanisms), Horizon Europe, and defence-related funding through organisations such as Dstl.

For UK Space Agency and ESA funding specifically, communication channels were established directly with UK Space Agency to obtain the most current and authoritative data available. This engagement provided access to more accurate figures than would otherwise be available through public sources alone, strengthening the reliability of estimates for these funding channels. These estimates are presented alongside the GtR analysis in the main report to generate the estimated aggregate annual totals for competitively-awarded funding, with methodological notes where assumptions were required.

Analysis methodology for other funding sources

Data and supporting analysis were provided by the UK Space Agency Analysis team to estimate the value of UK Space Agency funding directed towards research organisations in the UK. This included a breakdown of UK Space Agency spending across both ESA subscriptions (funding channelled to ESA on behalf of the UK) and UK Space Agency National programmes. These two streams were analysed separately and subsequently combined to estimate the total annual value of UK Space Agency-originating funding flowing to UK research organisations, forming one of the major public funding sources considered in this study.

For **ESA-related funding**, the UK Space Agency Analysis team drew on internal datasets, from which they calculated the approximate percentage of ESA contracts awarded to UK organisations classified as "research organisations" or "secondary or higher education establishments." To estimate the annual value flowing to the UK research base, we divided total UK ESA funding over this five-year period by five to obtain an annual average, using the estimated percentage provided by UK Space Agency. This produced an estimate of the average annual ESA funding directed towards research organisations in the UK.

Similarly, for **UK Space Agency National programmes**, analysis of UK Space Agency Spending Reports (finance data) by the UK Space Agency Analysis team led to the development of an estimate of the proportion of spend over the past five calendar years (2021–2025) that was awarded to research organisations, including universities and UKRI-related bodies. In line with the UK Space Agency team's request to use rounded proportions, the total National programme funding over this period was divided by five to obtain an annual average, and applied to estimate the annual value directed towards research organisations for inclusion in the aggregate annual competitively-awarded total.

ESA and National programme 'average annual' figures must be interpreted with caution. Figures rely on rounded proportions provided by the UK Space Agency, and are thus approximations with inherent margins of error. Moreover, the degree of precision varies between the two streams themselves, with the ESA-derived estimate generally drawing on a more stable underlying dataset than the National programme figure. Reported figures may therefore be treated as **indicative of magnitude rather than exact values**.

The "research organisations" category used by the UK Space Agency also includes a broader range of entities than those defined within the scope of this study. This category covers universities, NERC institutes and organisations such as the Met Office and the Satellite Applications Catapult, not all of which fall fully within the scope of the landscape mapping exercise. The same caveat may apply to National programme classifications. These estimates may therefore include a limited degree of out-of-scope activity. For these reasons, all UK Space Agency-derived figures in this study are presented as general shares and rounded approximations, and should be read as indicative estimates subject to error margins rather than precise accounting. This said, we view that it is unlikely that these definitional differences would lead to substantively different results.

Horizon Europe estimates were derived from the CORDIS portal,[115] the European Commission's primary database for EU framework programme results. We filtered for active projects within the "Space" domain that include UK organisations, excluding contracts to non-research entities. For multi-year programmes, total funding was divided by programme duration to derive annual averages. Aggregating these annualised figures across all applicable programmes yielded an estimated £6 million per year in Horizon Europe funding for UK space research.

Defence research funding estimates are based on UK Parliament written question responses from April 2025,[116] which reported Dstl spending on university grants and contracts totalling £50.75 million across FY2022-23 and FY2023-24. We conservatively estimate that 10% of this expenditure supports space-related research – a modest assumption given space's growing strategic importance for defence infrastructure and capabilities. Dividing by two to obtain an annual average yields approximately £2.5 million directed to research organisations for space-related work.

Where possible, funding estimates reflect the most recent annual data from official reports (UK Space Agency, ESA). However, for UKRI, Horizon Europe, and defence sources, data spanning multiple years necessitated temporal normalisation to ensure comparability. Multi-year totals were divided by the mean duration of constituent programmes or the observation period to derive annualised figures. This approach **controls for within-year variations** inherent in extended datasets and enables meaningful cross-source comparison, while acknowledging that actual annual disbursements may fluctuate around these averages.

Final dataset

Upon completion of the landscape mapping and funding analysis, the two workstreams were integrated to produce a **unified dataset of UK space-related academic research**.

The landscape mapping results, which identified space-relevant research organisations along with their geographical information, estimated researcher numbers, and applicable capability areas, were linked to the funding analysis outputs. This integration enabled the addition of funding metrics to each organisation, including total UKRI funding received and total number of grants awarded.

The final dataset thus provides, for each space-relevant research organisation:

- Organisation name and type (University, IRO, or RCI)
- Geographical information (postcode, ITL1 and ITL2 regions)
- Estimated number of active space-related researchers
- All applicable space capability areas
- Total UKRI funding received (from GtR analysis)
- Total number of UKRI grants received

This consolidated dataset enabled a **comprehensive analysis of the UK's academic space research landscape**, including the geographical distribution of organisations and researchers, the concentration of funding across institutions and regions, the relationship between organisational size and funding levels, and the spread of research activity across capability areas.

The funding analysis also provided an opportunity to validate the landscape mapping findings. Funding recipients identified through GtR and other sources were cross-referenced against the organisations identified in the initial landscape mapping exercise, confirming substantial alignment between the two datasets.

Impact of the UK’s academic landscape

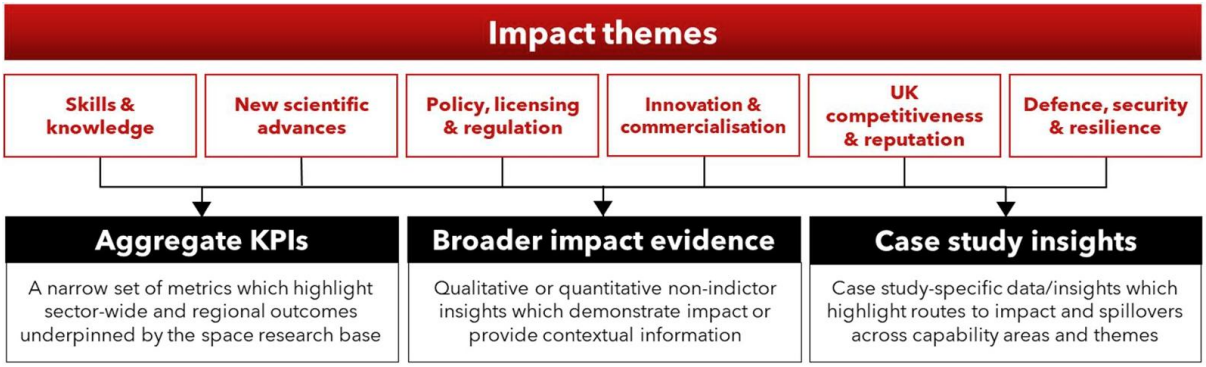
Overview of the approach

The impact assessment employed a **mixed-methods approach** to evidence collection, drawing on both quantitative and qualitative data from complementary primary and secondary sources. This approach captured the diverse routes through which research and training activities generated impact, with emphasis on the broader, underpinning role of the research base in supporting the wider space sector and economy.

Evidence was structured around **six interconnected impact themes**, aligned with the UK Space Agency's Benefits Framework and set out below.

To interpret all collected data, we employed **thematic analysis** to identify recurring patterns, mechanisms, and narratives across the research ecosystem, with particular attention to cross-cutting and spillover impacts spanning multiple domains.

Figure 13 Overview of the impact assessment methodologies and impact themes



Integrated evidence model

Evidence was collated through three complementary streams providing both breadth and depth of insight:

1. Aggregate KPIs provided system-level indicators highlighting broad patterns across the UK space research ecosystem. Desk-based research was used to identify the most relevant KPIs for each impact theme, selecting metrics best able to capture what each theme attempted to measure. The study relied heavily on the UK Space Agency's Size & Health of the UK Space Industry 2024 for key sector data, alongside other secondary sources. KPIs drew exclusively from secondary data and served as illustrative rather than exhaustive measures. While not providing comprehensive assessment, they bridged the aggregate data in landscape mapping and more granular case study insights. Limitations in scope and currency were acknowledged transparently in reporting.

2. Broader impact evidence provided contextual understanding between high-level metrics and specific case studies. This stream drew on qualitative and quantitative sources, including sectoral analyses and stakeholder perspectives, to illuminate emerging trends, pathways to impact, and systemic effects not captured in KPIs or case studies. Different evidence areas were explored for each of the six impact themes. For instance, key training pathways for students and early career workers, and the transfer of expertise between academia, industry, and government offered insights that drove analysis on the Skills & Knowledge impact theme.

3. Case Study Insights offered rich, context-specific evidence on the diversity of impact pathways characterizing UK space research activities. They formed a key evidence source, covering each impact theme and highlighting cross-sectoral knowledge exchange and spillover impacts. Case studies were selected to capture diverse and cross-cutting routes to impact, ensuring alignment with the study's aims. Selection drew on early findings, stakeholder insights, and prior studies to identify examples with high demonstrable impact, strategic relevance, and evidence availability. The portfolio balanced organization types, research and capability areas, and routes to impact, including both direct space activities and spillovers to adjacent fields.

Data collection methods

Three complementary data collection methods were employed to gather evidence across the impact themes: interviews, desk-based research, and bibliometrics.

1. Interviews were conducted (a total of 13 semi-structured interviews and follow-ups with 15 stakeholders) with key stakeholders to guide desk-based research, access non-published evidence, and obtain cross-cutting insights across impact themes. Direct engagement with stakeholders closely involved in the projects examined proved

invaluable in capturing the most relevant information to inform the study and its applicable impact themes. Interviews also informed case study selection and supplemented desk research where necessary.

Figure 14 List of stakeholder affiliations

Organisations
Satellite Applications Catapult
UK Research and Innovation
University of Birmingham
University of Portsmouth / Space South Central
King's College London
Space West
The Open University
Havant South Downs College
Heriot-Watt University
SuperSharp Space Systems
UK Space Agency
UKspace

2. Desk-based research served as the core evidence collection method, drawing on robust and defendable secondary sources to inform aggregate KPIs, case studies, and non-indicator evidence. A full list of sources is included in the endnotes of the report, though core sources included: UKRI's Gateway to Research, REF 2021 Impact Case Study Database, SPAN whitepapers, existing UK Space Agency evaluations, Size and Health 2024, SUN online resources, and various sector reports and analyses.[117]

3. Bibliometric analysis provided quantitative assessment of publication trends per capability area and UK contributions to space science missions. Two primary methods were employed: keyword searches for Earth Observation literature via the NASA ADS publication libraries and an analysis of ESA missions databases to identify relevant mission-relevant publications.[118, 119] Publications were exported, cleaned, and analysed for UK involvement, collaboration networks, and citation performance. The analysis also drew on comparison studies and our previous Gaia Interim Impact Evaluation to estimate the UK research community's share and contribution.[120] This approach highlighted areas of UK research leadership while acknowledging broader routes to impact beyond publications, including scientific breakthroughs and knowledge spillovers to other sectors.

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