Department for Science, Innovation & Technology

HM Government

Space Regulatory Review 2024

A targeted review of space regulations

May 2024

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Contents

Ministerial Foreword

More so now than ever, our lives on Earth depend on space.

Space underpins our economy and drives growth across the UK. Satellites help forecast the weather, keep people and businesses connected, products moving, and monitor our natural environment. They support aspects of our everyday lives from our phones to our internet and banking networks, to GPS and weather forecasts. Soon space technologies will enable services like driverless cars and smarter agriculture technology that will create a more productive, more sustainable future. Data gathered from space also keeps us safe, supporting critical national infrastructure networks, and our response to emergencies like fires, floods, and even volcanic eruptions.

Space is cheaper and more accessible. But while this encourages exciting commercial and state-owned competition, our orbital environment is becoming exponentially more congested, with over 11,500[1] satellites circling the planet. The UK is driving initiatives for a sustainable space domain through our work in the United Nations Committee On the Peaceful Uses Of Outer Space (UN COPUOS)[2]. We are also leaders in the development of space debris removal and space sustainability technologies. We enabled the first demonstrator of its kind[3] to launch into orbit and practice the retrieval of redundant satellites, reducing the risk of collisions in space and removing 'junk' from important orbits.

The national regulatory framework is helping us to deliver our ambition to become the leading provider of commercial small satellite launch in Europe by 2030. We enabled the first UK launch from Cornwall and plan to launch more from Scotland. His Majesty King Charles III has championed space sustainability, in the Astra Carta[4], which aims to convene the private sector in creating and adopting sustainable practices across the global space industry. But we cannot be complacent. We must act now to protect space for future generations.

Space is not only busier but evolving, with novel missions and innovative applications; development of UK launch sites and spacecraft; human spaceflight to the moon and its orbit; extending our horizons through deep space exploration; not to mention the opportunities of deploying critical technologies like artificial intelligence and quantum technologies, as set out in the Science and Technology Framework,[5] which will be vital to the future prosperity and quality of life of the British people.

[1] Figures based on the latest data published by the European Space Agency's Space Debris Office as at 6 December 2023.
[2] UN COPUOS and its implementation body, the UN Office for Outer Space Affairs (UNOOSA), are the leading international bodies for space legislation, regulation, capacity building and standards.
[3] Elsa-D was an Astroscale UK licensed demonstrator for the retrieval and removal of space debris.
[4] The Astra Carta framework has been developed by the Sustainable Markets Initiative and was launched by His Majesty King Charles III, in his previous role as Prince of Wales, at the Space Sustainability Summit in 2022. It aims to convene the private sector in creating and accelerating sustainable practices across the global space industry.
[5] https://www.gov.uk/government/publications/uk-science-and-technology-framework/

As a result of this Government's leadership, the UK is opening space frontiers. The UK has a new career astronaut (Rosemary Coogan), a parastronaut (John McFall) and a reserve astronaut (Meganne Christian). UK science and technology embedded within the mission that are on their way to study Jupiter, Mercury, the Sun, and the Moon, and is already onboard the International Space Station. It made possible the most powerful telescope ever launched into space - the James Webb Space Telescope. The UK-built Rosalind Franklin Rover mission will land and then search for life on Mars in the coming years.

Others are also driving change. The US is raising its standards for disposal of redundant spacecraft to minimise the possibility of creating new space junk, and penalising commercial operators who fail to meet their obligations for the protection of vital orbits. The Japanese space agency (JAXA) was among the first in the world to develop space debris mitigation guidelines[6]. The EU is drafting Space Law with plans to link sustainability and innovation to market access. We will continue to drive debate in the UN[7] to set international norms and galvanise other space nations to follow the UK's ambition to ensure space continues to deliver for all humankind.

Safety and sustainability cannot be areas for competition, instead they require collective agreement and mutual support. We must work towards likeminded countries and regions recognising each other's progressive initiatives and using that collective impact to support emerging spacefaring nations to reach similar targets. If we can achieve this, we will set the conditions for responsible growth in our collective space endeavours.

Well-designed regulation is pivotal in supporting future economic growth, catalysing investment, enabling innovation, meeting our sustainability goals, supporting our launch capabilities, prioritising safety and national security, promoting diverse values across the space ecosystem, and delivering our ambitions as a science superpower.

Today, government is proposing 17 recommendations. We believe these will equip the UK's regulatory regime to meet the challenges of the future and strengthen our domestic resilience and international partnerships. They will provide the clarity and certainty needed to build confidence in our flourishing space economy. They will catalyse sustainable growth, innovation, and investment to ensure we stay at the forefront of shaping the future of space.

[6] https://www.unoosa.org/documents/pdf/spacelaw/sd/Japan.pdf
[7] UN Committee on the Peaceful Uses of Outer Space (COPUOS) and UN Office for Disarmament Affairs (ODA)

Andrew Griffith MP, Minister of State in the Department for Science, Innovation and Technology

Anthony Browne MP, Parliamentary Under-Secretary of State for Decarbonisation, Aviation and Technology in the Department for Transport

Lord Dominic Johnson of Lainston CBE, Minister for Investment & Regulatory Reform in the Department for Business and Trade

Executive Summary

"Astronauts' lives are dependent on a safe environment, so it's great the UK is taking a lead in regulation as well as space exploration. Having recently graduated and now being an ESA astronaut, I am really looking forward to putting my skills into practice. Continuing to strengthen our regulatory regime with global partners will help to manage and reduce space debris, making space safer for astronauts as well as the many satellite services which we depend on through our daily lives on Earth"- **UK ESA Astronaut Rosemary Coogan**

Introduction

The UK's trusted, modern space regulatory framework has recently enabled the first commercial demonstration of debris removal from orbit, and the first launch from UK soil. It has supported the delivery of connectivity anywhere on the globe, including in sparse deserts and open oceans, enabling anybody to connect from anywhere at any time. But in a world of constantly evolving technological advancements, we cannot afford to be complacent; we need to build on our regulatory capabilities and ensure that our framework remains agile and fit-for-purpose.

Nascent markets are emerging in the sector, such as the ability to make use of low gravity environments to manufacture exquisite nanostructures or pioneering pharmaceuticals are being developed, as are novel ways to using Low Earth Orbit satellites as a platform for high-speed, low latency connectivity anywhere on the planet[8]. New and exciting space services, including sustainable space operations like debris removal, life extension through in-orbit servicing, refuelling, or repurposing by adding payloads and transporting spacecraft to new orbital locations, and the ability to assemble large infrastructures in space with the potential to support life on our planet.

These opportunities extend beyond our traditional use of orbits around the Earth, reaching across space to the moon and far beyond. The application of new technologies such as artificial intelligence, quantum and future communications will revolutionise many of our existing and future space-based services. But these technologies will need to be adopted responsibly to maximise the benefits they offer whilst minimising the risks they carry. Responsible exploration and resource management, coupled with extending the protections we apply to Earth orbit to these new fields of discovery, are critical to ensuring space remains accessible to all humanity now and in the future.

To be successful in these endeavours we must also be highly attractive to global capital, encouraging the UK sector to back itself whilst attracting investors and businesses to our shores. We must build confidence in the UK as the place to build and operate responsible space capabilities, assured by the support provided from a globally recognised and

[8] Further information about the UKSA's C-LEO Programme is available online here: https://www.gov.uk/government/publications/c-leo-programme/about-the-c-leo-programme

competitive regulatory framework. We must work with the City of London, investors, and insurers, to understand what drives them to invest in space and find ways to build those attributes into our space offer.

This targeted review explores ambitious, novel, and emerging areas where we need to act now if we are to maintain an innovative, attractive and competitive regulatory environment for the UK space sector. It focuses on agile approaches to rapid change to continuously improve our current framework[9]. This review has been delivered in consultation with commercial, academic and government stakeholders and the primary independent regulators for space, the Civil Aviation Authority (CAA) and the Office of Communications (Ofcom).

The review builds on the goals of the National Space Strategy, and aligns with the Innovation Strategy[10], the recently published Space Industrial Plan[11]. the regulatory diplomacy ambitions of the Integrated Review and draws on the Pro-Innovation Regulation of Technologies Review[12].

Methodology

A review team consisting of the Department for Science, Innovation and Technology (DSIT), the UK Space Agency (UKSA) as well as the Department for Business and Trade (DBT) and the Department for Transport (DfT) partnered with a broad representation of the UK space sector from commercial developers and operators to academia and scientific research bodies to deliver this report.

The evidence gathered would not have been possible without more than 300[13] stakeholders from across the space, regulatory, finance and insurance sectors. We worked with primes[14]; SMEs of various sizes from the whole spectrum of the space value chain; with academics and scientific institutions; and with industry bodies and advisory groups that make up the rich tapestry of UK Space. Their diverse perspectives, particularly on their experience of operating within the UK regulatory framework as compared to other national regimes, has been vital to evidence where regulation is performing well and spotlight areas where we can do more. Our approach involved a series of UK-wide engagements including Edinburgh, Belfast, Leicester and London to gather evidence on areas for improvement or where these new opportunities are emerging.

[9] This targeted review consciously identified a number of ongoing initiatives, such as the consultation on liabilities and insurance or the lessons identified from first launch from the UK, out of scope in order to avoid duplication and the potential to delay progress in areas already undergoing reform.
[10] https://www.gov.uk/government/publications/uk-innovation-strategy-leading-the-future-by-creating-it/uk-innovation-strategy-leading-the-future-by-creating-it-accessible-webpage#part-3-achieving-vision-2035
[11] https://www.gov.uk/government/publications/space-industrial-plan
[12] https://www.gov.uk/government/collections/pro-innovation-regulation-of-technologies-review
[13] Over 300 representatives from across the space sector engaged in workshops and interviews, the results of which we have considered in our evidence. The UK Space Agency has received 45 responses to the UKSA-led consultation on liabilities and insurance, which are now being considered.
[14] A UK prime is defined as a business that sits at the head of a supply chain or supply network

Key findings

Analysis of the evidence gathered has enabled us to identify 7 themes that would, if fully implemented in regulations, deliver the greatest impact for the sector, the economy and all of us who benefit from space. If implemented, the sector would benefit from greater transparency and coherence across the responsible policy and regulatory bodies, linking initiatives with access to finance and insurance products, and a range of measures to enable innovative and sustainable approaches to nascent markets.

The overarching message from the sector is that they would like government to continue to deliver the **clarity and certainty** needed to provide **confidence** in and **competitiveness** to the UK sector, investors, and the wider global space community.

This report identifies 7 priority regulatory outcomes for the UK space environment and 17 recommendations on suggested actions that could help deliver them. These include:

OUTCOME #1 AGILITY - A streamlined, proportionate and responsive space regulatory environment that ensures greater coordination across regulators and government departments.

1. Improve transparency by publishing clear information on roles, responsibilities and relationships of government bodies involved in the regulatory process.
2. Clarify government policy and priorities to maximise the space regulators'[15] discretion for responsive and proportionate decision-making, within established boundaries[16].
3. Work with independent regulators to drive out duplication and demands for excess information, and reduce the time, cost and complexity of the licence application process.
4. Support the establishment of domestic and international cross-regulator associations, where appropriate, to enable greater clarity and coherence across shared regulatory interests.

OUTCOME #2 INNOVATION - A dynamic, responsive regulatory development framework that supports novel and emerging missions and technologies to enable early leadership in nascent markets.

5. Establish a regulatory toolkit via sandboxes, testbeds or other innovative approaches that can target support to new mission types, enabling UK access to and leadership in nascent markets. Support regulators, where appropriate, to evolve regulations, taking into account emerging market opportunities.

[15] Primarily the Civil Aviation Authority (CAA)
[16] We will work to ensure this collaborative approach avoids impacting the statutory independence of the regulator.

6. Publish clear government policy and guidance signalling our future intent and priorities in emerging priority areas such as artificial intelligence and quantum technology. Provide clarity to regulators and the sector and de-risk development of UK capabilities in Earth orbit, around, and on, the Moon and beyond.

OUTCOME #3 GROWTH - A progressive regulatory framework that encourages healthy competition, risk taking investment, unlocks market access, and promotes good practice, while driving out irresponsible behaviours

7. Reward responsible space system developers by identifying potential financial tools, incentives and market access schemes that promote sustainable activities and in turn encourage self-investment, inward investment and support a level playing field for UK companies.
8. Deliver a communications campaign to sharpen government and private sector messaging on our forward leaning, incentive-driven approach to UK space regulation for prospective inward investment and onshoring entities, demonstrating the competitive advantages of operating in the UK.

OUTCOME #4 INTERNATIONAL PARTNERSHIPS – A multilateral alliance with other established and emerging spacefaring nations, working towards aligned regulatory frameworks and international best practice that prioritise sustainability and smooth cross-border trade.

9. Deliver a diplomacy package that works with established and emerging spacefaring nations, international partners including the UN and wider industry, to build a multilateral alliance focused on space regulation which enables smooth cross-border trade and boosts growth.

OUTCOME #5 SAFETY AND SUSTAINABILITY - A world-leading approach to incentivising sustainable space activities, protecting the space environment, its celestial bodies and our freedom to act in a safe, secure and sustainable way.

10. Define space sustainability and publish UK policy guidance for best practices, providing greater certainty of government future direction.
11. Publish appropriate regulatory guidance for the development and adoption of sustainability standards in our domestic framework.

OUTCOME #6 ACCESSIBILITY - A coherent, easy to understand suite of primary and secondary space legislation and clear published guidance that all types of organisations can easily interpret and operate under.

12. Evaluate the benefits and risks associated with targeted amendments to primary space legislation in the longer term, including consideration of the potential to merge, refocus or realign the applicable Acts.

13. Deliver a programme of continued regulatory improvement to provide clarity to industry and refine, amend, and update the supporting Space Industry Regulations[17], as required.

14. Conduct a cost-benefit analysis for government of licensing entities with no financial or developmental interests in the UK, its Crown Dependencies or Overseas Territories.

OUTCOME #7 NATIONAL INTEREST - A civil and commercial space regulatory framework that supports UK national security.

15. Update DSIT-led Earth Observation Data Security policy, and wider space data security regulations, to enable equitable market access whilst preserving UK security interests.

16. Ensure national security and national interest considerations are embedded in all licensable space activities and develop clear policy guidance on the applicability of the regulatory environment to government-sponsored space activities, including exemptions where applicable.

17. Create appropriate and proportionate requirements for the security and protection of space systems, both for the control of the end-to-end system and of payload services and their data.

Implementation

We will establish a sector-wide, cross-government implementation team, to be centrally coordinated by DSIT, who will undertake the next three phases of implementation: further in-depth assessment and prioritisation; designing action plans for each outcome, and action plan delivery. Progress on major milestones will report into existing National Space Strategy governance structures.

Whilst the UK Government must lead, it cannot and should not deliver these recommendations alone. It is essential that we continue to work with the wider sector and international partners. The partnership developed during this review has delivered momentum, trust, and shared commitments which we must capitalise on to ensure we deliver the outcomes identified for our future success. We must also work closely with our independent regulators, taking care to preserve their statutory obligations whilst providing the necessary support to enable delivery of these priority outcomes.

[17] the Space Industry Regulations 2021 make provision to enable the licensing and regulation of spaceflight activities, spaceports and range control licences services in the UK

Introduction

Context

Space regulation is the backbone for safe, secure, and sustainable space activities from the UK and in outer space, governing everything from satellite launches to lunar and deep space exploration. Well-designed regulation is vital for safeguarding national security and global collaboration, maximising the benefits of space on Earth, and paving the way for innovation, exploration, and scientific endeavour. Without effective rules and oversight, there is an increased risk of endangerment to human life, accidents, collisions, and space debris proliferation, posing risks to satellites, spacecraft, and other objects in orbit. With effective and proportionate regulation, we can mitigate these risks while also supporting innovation, growth and the greater benefits for science, our own planet's environment, and the wider population.

An illustration to show the number of satellites orbiting Earth in Low Earth Orbit. (© NASA)

Progressive regulation

The UK has one of the most advanced space regulatory regimes in the world. The 2018 Space Industry Act and 2021 Space Industry Regulations were groundbreaking, building on the experience the UK had gained licensing satellite operations under the Outer Space Act 1986 (OSA), to also enable UK launch, spaceport, and range control activities. This was reflected in the DfT Space Industry Act Review (Annex A). Our outcome-focussed and non-prescriptive regime is designed to be adaptive to emerging technologies and has already facilitated the first launch from UK soil and enabled world-first, cutting edge missions such as Active Debris Removal demonstrators[18]. We were the first country to enact all the required legislation to license commercial spaceport and

[18] RemoveDEBRIS, a research project to demonstrate ADR technology operated by SSTL, was licensed in the UK in 2018 and ELSA-d, a commercial ADR demonstrator by Astroscale, was licensed in the UK in 2021

launch activity in Europe, and since 2013 only the US has registered more satellites in orbit with the UN[19].

We have led the way in protecting the space environment in a number of areas, playing an active role in agreeing the UN's Long-Term Sustainability (LTS) guidelines for space, and implementing both this approach, and the Inter Agency Debris Co-ordination Committee debris mitigation guidelines, in our national regime. This includes spearheading international capacity building, partnering with the UN's Office for Outer Space Affairs (UNOOSA) on projects to champion implementation of the LTS Guidelines. International agreement is essential to driving up standards for safety, security and sustainability, and we are working to ensure both domestic and multilateral frameworks align, whilst remaining competitive, reflecting the need to protect the space environment and our ability to utilise it responsibly.

For the lunar environment and beyond Earth orbit, we are developing our own regulatory framework to give regulatory clarity for UK industry to participate in the emerging lunar economy. The UK is an active participant in wider international discussions on lunar regulatory issues in both the Committee on Peaceful Uses of Outer Space (COPUOS) and as a member of the Artemis Accords. In February 2024 the UK Space Agency stood up a Planetary Protection Advisory Panel, to ensure planned and future UK licensed missions to the Moon and other celestial bodies avoid harmful contamination.

In July 2021 the UK established an independent regulator for space in the Civil Aviation Authority (CAA), with the capacity and capability to license launch, orbital, re-entry, spaceport, and range control activities in one place. Since taking on this role the CAA has issued 355 orbital licences, two spaceport licences (Cornwall and SaxaVord), one range licence and one launch operator. Overall, investment statistics suggest that investors have a good level of confidence in the UK as a regime they can invest in (the Space Sector Size and Health survey suggests we secured approximately 17% of all private investment into the global space sector in 2022[20]).

And we are not being complacent. There is already important space regulation, licensing, and legislation activity underway or imminent across government and in the independent regulators. For example:

- UKSA consulted on incentive-based insurance and charging mechanisms to encourage the adoption of space sustainability measures with variable liability limits and fees for satellite operations. The consultation, which also explored developing a long-term space sustainability roadmap, closed on 5 January and the Government expects to issue its response by the Autumn.
- The CAA has reviewed its Regulator's Licensing Rules to reduce administrative burdens in the licensing approach for all licence types in response to lessons learned from first launch. In parallel, the CAA has increased pre-application

[19] Based on data from the UN Register of Space Objects covering UN registered satellites in orbit launched from 2013 to 2023: USA 4,953; UK 685; China 442. (Data obtained on 29 February 2024.)
[20] https://www.gov.uk/government/publications/the-size-and-health-of-the-uk-space-industry-2022/size-health-of-the-uk-space-industry-2022

engagement, run workshops on particular parts of the licensing requirements, enhanced its engineering analysis capability and grown its numbers of case officers and continues to deliver a wide programme of improvements. Ofcom has recently published its Space Spectrum Strategy and has actively championed UK interests in space through its delegation to the World Radio Conference and its engagements with government stakeholders.

- A Private Member's Bill is proceeding through parliamentary stages, with support from government, to address a key ask of the space sector by seeking to make it a mandatory requirement for an operator licence to include a limit on an operator's liability under section 36 of the Space Industry Act.
- See Annex B for a full list of current cross-government initiatives.

So why do we need a review?

We need to be ready for the future of science and technology

The future 'spacescape' of the commercial space sector is evolving at speed alongside the rapid evolution of new technologies. Despite ongoing initiatives, many in the industry feel that regulation is not keeping pace with innovation. **We can go further to seize the opportunities of pro-innovation regulation** and maximise the benefits of a sector that boasts exciting technological advancements.

Developing our regulatory approach to support emerging in-orbit technology such as Active Debris Removal (ADR) and In-Orbit Servicing will help foster a sustainable space environment by extending the life of satellites or safely disposing of them, reducing the population of defunct objects in orbit. This will also open up an emerging in-orbit economy, where companies operate satellites in orbit that service customers, carrying out refuelling or repairs to other satellites and paving the way for innovations such as in-space assembly, manufacturing, and space-based solar power. Forecasts show that the global In-Orbit Servicing market is predicted to be valued at ~£3.5. billion (in cumulative revenues) within a range of £1.8-5.7 billion by 2030[21] and that the UK is considered to be well placed to capture 18-28% of the market, equating to ~£800 million in cumulative revenues by 2030 of which ADR is expected to contribute £87-134 million[22].

[21] Northern Sky Research, IOSM Market Report 4, 2021
[22] UK In-Orbit Servicing Capability – A Platform for Growth, Satellite Applications Catapult 2021. Conversion rate from dollars to pound accurate as of 19 March 2024

Images of innovative advanced technology concepts. Credit: NASA Jet Propulsion Laboratories.

There are estimates of more than 400 lunar missions planned in the next decade and £108 billion in investment by 2032[23]. The growth of the nascent lunar economy will drive innovation and novel technology development, such as in-situ resource utilisation, that could deliver benefits here on Earth while also helping humans push further into the solar system. Plans to develop capabilities for lunar missions include remote sensing, communications, and navigation, as well as assembling lunar stations both on orbit and on the surface of the moon. The UK is also developing spaceports across the country and more, innovative ways to launch into orbit, to ensure we are able to access the opportunities space offers.

The electromagnetic spectrum is the lifeblood of space capabilities. Access to radio waves is critical for controlling spacecraft, monitoring their health and environment, passing data to, from and between satellites and crucially enabling us to monitor climate change and environmental conditions on Earth. Spectrum is a finite resource, but space is not the only user. The UK needs to work within our international obligations to ensure equitable allocation and use of these frequencies in orbit, beyond orbit and around the moon, and deliver a level playing field for our space sector. Increasing spectrum congestion and the huge upsurge in data flowing around the planet will see demands for spectrum grow, so it is important that space is fit, able and willing to make more efficient use of available spectrum through technological advances that improve our ability to co-exist with other users. We must also make sure we protect our national interests, both through enabling fair and proportionate competition, working multilaterally with international partners, and by ensuring appropriate controls are in place to preserve our security, prosperity, and freedom of access to space applications that benefit us all.

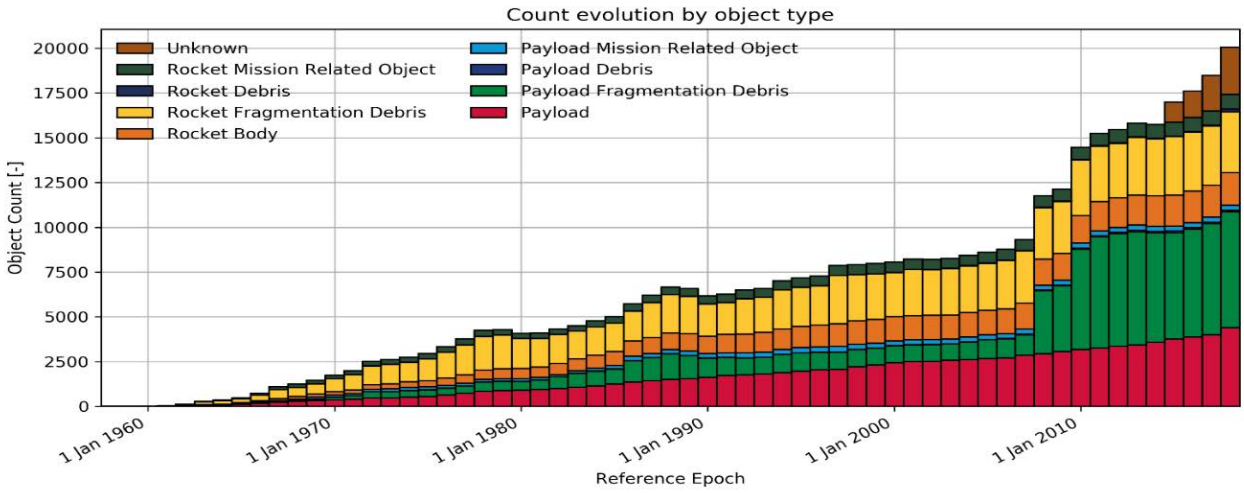
We have the opportunity to ensure responsible adoption of exciting developments in artificial intelligence, quantum engineering, biotech, and other areas of critical interest to our future as set out in the Science and Technology Framework. Space is a data rich environment where we deploy a variety of sensors to monitor our environment, communications networks to support our global connectivity, and constellations that use data to provide us with accurate time or positioning information. All these applications have the potential to evolve rapidly with the adoption of new technology, but this must be

[23] Northern Sky Research, Moon Market Analysis, 2nd Edition. March 2023

achieved with care, taking account of safety and security concerns as we exploit new tools and techniques. To enable novel and emerging technologies we must deliver rapid, agile regulatory guidance whilst protecting the fundamental tenets of safety, security, and sustainability.

We need to protect our space environment

Since the start of the space age in 1957 the exploration and utilisation of space has come a long way. Recent years have seen a significant increase in the number of satellites in orbit, as well as defunct rocket bodies, debris from in-orbit break-ups and even tools dropped by astronauts working in space. There are now 11,500[24] satellites in space, 9,000 of which are functioning. Over 35,000 debris objects are being tracked and catalogued by space surveillance and tracking networks. But not all objects can be tracked, and statistical models put the number of pieces of debris larger than 1mm at 130 million. We must take steps to ensure our surveillance capability keeps pace with space activity and that operators access and apply this data to protect themselves and others from the risk of collision or interference.



Graph showing the evolution of the tracked and published space object population since the start of the space age (© ESA)

Space regulation plays a critical role in promoting better sustainability in space and reducing the risks that space debris and congestion poses to future space activities. Large constellations are being launched into space that deliver unparalleled global connectivity to communities and locations where ground infrastructure cannot reach. This significant step for all humankind also presents challenges, both through additional congestion in orbit, the need to manage loading capacity such that space remains accessible for all, and the increased potential for debris creation from launch and operational activities. We must continue to ensure innovations such as these are managed carefully and take steps to accommodate and protect the opportunities they deliver, whilst mitigating any impact on our space environment.

[24] Figures based on the latest data published by the European Space Agency's Space Debris Office as at 6 December 2023.

As we explore beyond Earth orbit, we must also ensure we safeguard the environments of the Moon and other celestial bodies. We can learn the lessons of the orbital environment by starting as we mean to go on and avoiding harmful contamination, enabling us to expand our understanding of the Universe.

> To capitalise on the benefits of an emerging lunar economy we must address the challenges, such as end of mission disposal, lunar science preservation, and how to operate in an increasingly crowded lunar environment, reinforcing the need for safe, sustainable, and responsible lunar use by all parties. As we look towards licensing the UK's first lunar missions, the UK must play an active role in shaping the developing norms and regulatory policy of the burgeoning lunar economy. It is therefore vital that we preserve the space environment so future generations can enjoy the same access to space that we do**.**

We need to support a thriving space sector that delivers for the UK

Growth, through a combination of self-investment, inward investment and onshoring, attractive exportable products and services and world beating financial and insurance markets, is vital if we are to benefit from the potential of 'New Space'[25] and play a part in its protection. So, we must ensure our regulatory environment is attractive to responsible investors, encourages the UK sector to back itself and attracts businesses to our shores. By developing incentives to link sustainable practices to attractive financing, we build confidence in the UK as the place to deliver responsible space capabilities. As a globally recognised advanced regulatory framework, it is critical to we can maintain our influence and promote responsible spacefaring. So, we must also work with the City of London, investors, and insurers, to understand what drives them to invest in space, what part environmental, social and governance factors play in their decision making, and how we can use those attributes to incentivise responsible space practices.

When compared to other environments, space has a well-established but sparse international legal framework. Whilst the UK regulatory framework is considered one of the most advanced and contemporary in the world, we cannot afford to be complacent. Whilst our investments in technology and mission development are generating huge leaps forward in sustainable applications, our regulatory policies have the potential to deliver much more.

[25] New Space' refers to the increasing commercialisation of the space sector, moving beyond purely state activity

Aim

The aim of the review is to ensure that the UK continues to offer an agile, attractive, and competitive regulatory environment for space, which encourages innovative and sustainable practices, supports growth and investment, and champions the safe, secure and sustainable use of space that delivers for the people and preserves access to these benefits for future generations. This aligns with the goals of the National Space Strategy, the Innovation Strategy[26], the Space Industrial Plan[27]. the regulatory diplomacy ambitions of the Integrated Review and draws on the Pro-Innovation Regulation of Technologies Review[28].

Objectives

- **identify** gaps and opportunities in current and planned space regulation.
- **apply** the strategic priorities of space safety, security, sustainability, and growth in all current and future space regulation initiatives.
- **support** the national objectives of maintaining the UK as a global science superpower and a global leader in modern, agile, sustainable space regulation.
- **provide** a framework for departmental leads with responsibilities for space regulation to dock into, enabling cross-government coherence and cooperation including in consultation with the sector and in the submission of the findings into a single report.
- **co-ordinate** effectively with other regulatory processes such as spectrum management and export control.
- **deliver** a comprehensive set of targeted recommendations and priorities for the future regulatory environment of the space sector, with lead departments clearly identified.

Scope

This review intends to complement and build on ongoing regulatory development by identifying ambitious, novel and emerging areas where we believe the UK can carve out advantage through leadership and collaboration between commercial, academic and government stakeholders. It supports DfT's Review of the Space Industry Act; provides a more specific focus on regulatory policy for orbital operations set out by UKSA; and suggests potential approaches to a more agile, adaptable, and efficient licensing process through the support government can provide to the independent regulators in the CAA, Ofcom (on spectrum) and other regulatory bodies.

The Space Regulatory Review set out to deliver three primary functions:

[26] https://www.gov.uk/government/publications/uk-innovation-strategy-leading-the-future-by-creating-it/uk-innovation-strategy-leading-the-future-by-creating-it-accessible-webpage#part-3-achieving-vision-2035
[27] https://www.gov.uk/government/publications/space-industrial-plan
[28] https://www.gov.uk/government/collections/pro-innovation-regulation-of-technologies-review

1. An overall assessment of the Space Industry Act, including the performance of the UK's new licensing regime and to identify any unintended consequences or barriers.
2. Identify gaps and solutions in planned activity where stakeholders have indicated a need for regulation (or deregulation) to support the continued growth of the UK space sector and government priorities.
3. Crucially, set out next steps for developing an implementation plan for identified improvements to the space sector regulatory framework, where appropriate working in partnership with the sector and independent regulatory bodies.

Out of scope activity includes: human spaceflight regulation, Astra Carta and the consultation on space insurance and liabilities, although all relevant insights from these activities have been considered here. Whilst identifying potential areas for improvement, the report also recognises the independence of our regulatory bodies and seeks to aid, through collaboration and mutual support, areas they may choose to pursue.

Methodology

Evidence gathering and stakeholder acknowledgment

To produce this report, a review team consisting of DSIT, DBT, DfT, and the UKSA consulted government officials, experts across industry, academia, science, finance, and insurance communities, and across the country (including in Belfast, Edinburgh, Harwell, Leicester, and London). Alongside consultations, calls for evidence, questionnaires, workshops, and direct engagement as appropriate, we spoke with core expert advisory

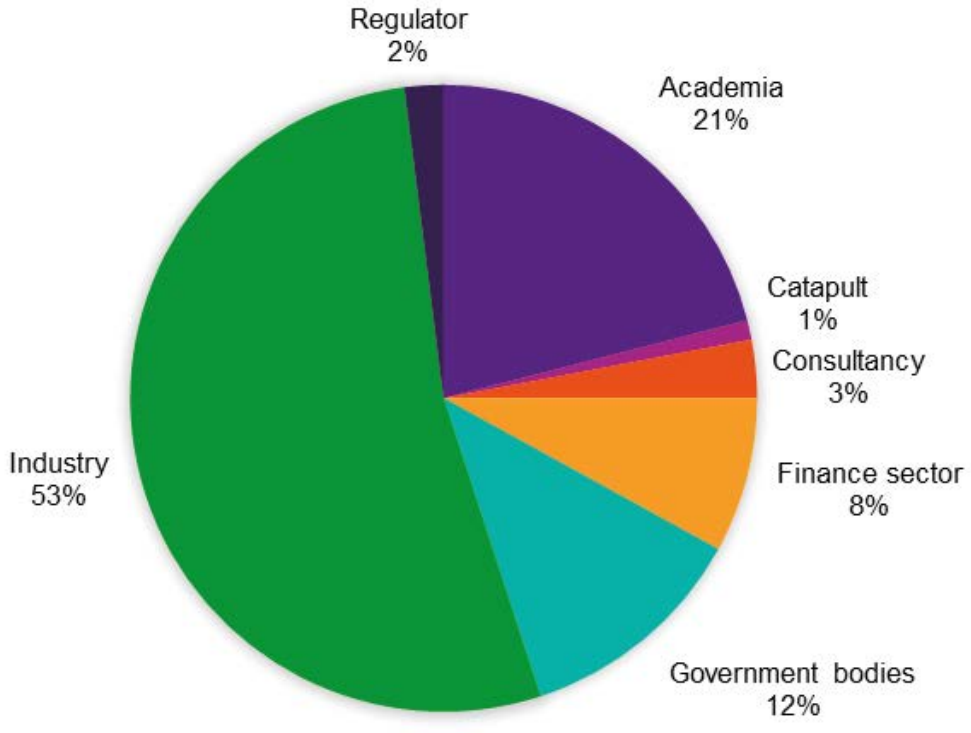


Figure 1: Pie chart showing spread of stakeholder engagement

groups, in particular UK Space (the trade body), the Space Academic Network (SpAN) and Space Universities Network (SUN), the Spaceflight Safety and Regulatory Council, the Regulatory Advisory Group, and the Space Partnership. **In total we engaged with over 300 stakeholders from 100 stakeholder organisations.**

For a more detailed overview of the review methodology see Annex C.

Evidence from other sources

Regulatory Horizon Council Report on The Future Regulation of Space Technologies

In addition to the work set out above, DSIT invited the Regulatory Horizons Council[29] (RHC) to conduct a review of key current and future technologies and how enabling regulation can support their responsible adoption in the space sector. Its report is published alongside this review and is accessible on the RHC webpage.[30]

The RHC's key finding is that, given the range and scale of activities likely in space over the next 10 – 20 years, and the rapid pace of technological development, in future the UK will need to develop and mature our regulatory approaches both internationally and domestically. The RHC identified several areas where the UK has particular strengths: namely, leveraging our world-leading financial services and legal sectors - for example in the provision of insurance services and legal arbitration - as well as particular technologies including data science and artificial intelligence, telecommunications, positioning, navigation, and timing (PNT), quantum technologies, semiconductor design, engineering biology and novel materials which will be critical to creating and deploying future capabilities in space.

We acknowledge the further contribution by the RHC regarding future space regulatory policies that fall beyond the scope of the Space Regulatory Review. We will be providing a full response via ministerial letter in due course.

[29] The Regulatory Horizons Council (RHC) is an independent expert committee that identifies the implications of technological innovation, and provides government with impartial, expert advice on the regulatory reform required to support its rapid and safe introduction.
[30] https://www.gov.uk/government/groups/regulatory-horizons-council-rhc#reports

Spaceflight liabilities and insurance

Space sustainability is and will continue to be a key focus influencing the development of the new policy approaches for orbital activities. The government issued a consultation in September 2023 on orbital liabilities, insurance, charging and space sustainability, which included proposals for an incentive-based approach by setting variable limits of operator liability and providing licence application refunds for orbital operations licences to reflect operators' adoption of space sustainability measures. Analysis of the responses is continuing, and the government will issue its response as soon as possible in the coming months.

Lessons learnt from first launch

Following the first launch from the UK in January 2023 DfT, CAA, UKSA, the Ministry of Defence (MOD) and DSIT engaged in a lessons learnt exercise and delivered an actionable report [31] on improvements to the current approach. This report has been considered alongside the material gained through our engagement to capture any areas that related to this work.

[31] UK Spaceflight Programme Lessons Learned Report dated 18 July 2023

Key findings and recommendations

Key findings

The overwhelming message from industry, academia and government stakeholders was the need for **clarity, certainty,** and **confidence** – the regulatory keys to unlock growth, innovation, and sustainability ambitions, delivering a **competitive** offer whilst ensuring we promote a safe and secure operating environment. If we take targeted steps to keep pace with rapid change in the sector and accelerate our continuously improving regulatory framework we can deliver the goals of safety, security, and resilience; growth; innovation; and the broad benefits to our people from our activities in space.

Clarity

To enable development of new technologies, capabilities, and applications it is essential we agree a mutual understanding of applicable regulations between industry, academia and the regulators. There is also a clear demand for continued leadership and acceleration of our approach to space sustainability, both to ensure we protect the environment in which the sector operates and to demonstrate our credentials and intent in a challenging investment market. We will make improvements to regulatory guidance to provide sufficient clarity to enable collective understanding of the standards required whilst avoiding moving towards a prescriptive regime that could stifle innovation.

Certainty

The global landscape is changing with many large and nascent markets driving expectations for operators to demonstrate their space sustainability credentials. The UK should set out its approach to supporting the work that the industry-led Earth and Space Sustainability Initiative is doing to develop standards in key areas across the orbital economy, through the proportionate use of incentives, regulation, or legislation. Lunar exploration is also driving international discussions over Lunar norms and acceptable behaviours, particularly on in situ resource utilisation, and the UK should set out domestic and international policy in order to provide UK industry with the certainty to invest in the developing Lunar economy.

It is also critical that we maintain balance between pace of change in regulatory guidance and the certainty the sector needs to develop next generation capabilities. Developing an approach that takes account of the long lead time needed for space system and technology development, coupled with projected life cycles of operational capabilities, will provide certainty in the planning and execution of new missions.

Confidence

Providing clarity and certainty will enable developers, investors, and international operators to have confidence in moving to, operating, and investing in the UK space sector. Engagement with stakeholders highlighted that the major factors to achieving success include the ability to recognise heritage in products, systems, or mission types; access world class finance and professional services with well-informed insurance and

risk assessors; rely on the future regulatory framework due to improved transparency and stability of our approach.

Competitiveness

The UK offers a robust, business-friendly regulatory environment to reliably expand, trade and invest. A well designed, world leading, regulatory framework for space provides the opportunity investors need to do business in the UK, and the flexibility to encourage innovation, whilst maintaining sustainable opportunities for growth by protecting and preserving the space environment for all. By standing out globally, we provide an attractive offer for Foreign Direct Investment (FDI) and private capital and set the stage for innovative UK based companies to stay ahead of the curve and grow through exports.

An illustrative example of the 'Opportunity of Space' investment continuum (© Seraphim 2024)

Investment in the sector comes from many actors, commercial and government, and at a number of key points in a development cycle. Ensuring investors retain confidence in the potential of space opportunities is a key outcome of our regulatory policies. Confidence is derived from certainty in the ability of developers to meet known regulatory criteria, which itself is supported by clarity and transparency in the regulatory framework. Linking sustainable practices to investment opportunities through incentives and prioritising the enabling regulation needed for novel, groundbreaking mission types that are creating new markets were seen as critical to maintaining our global leadership in this field.

Priority Outcomes

Based on the evidence collected during this review, we have identified 7 priority outcomes for the UK space regulatory environment, summarised as:

1. **AGILITY** - A streamlined, proportionate and responsive space regulatory environment that ensures greater coordination across regulators and government departments
2. **INNOVATION** - A dynamic, responsive regulatory development framework that supports novel and emerging missions and technologies to enable early leadership in nascent markets
3. **GROWTH** - A progressive regulatory framework that encourages healthy competition, risk taking investment, unlocks market access, and promotes good practice, while driving out irresponsible behaviours
4. **INTERNATIONAL PARTNERSHIPS** – A multilateral alliance with other established and emerging spacefaring nations working towards aligned regulatory frameworks and international best practice that prioritise sustainability and smooth cross-border trade.
5. **SAFETY AND SUSTAINABILITY** - A world-leading approach to incentivising sustainable space activities, protecting the space environment, its celestial bodies and our freedom to act in a safe, secure and sustainable way[32]
6. **ACCESSIBILITY** - A coherent, easy to understand suite of primary and secondary space legislation and clear published guidance that all types of organisations can easily interpret and operate under
7. **NATIONAL INTEREST** - A civil and commercial space regulatory framework that supports UK national security

Strategic alignment

The National Space Strategy (NSS) outlined regulation as one of the seven enabling intervention areas where government possessed the tools needed to achieve our growth and resilience ambitions and an important lever in delivering the four NSS pillars:

1. Unlocking growth in the space sector
2. Collaborating internationally
3. Growing the UK as a science and technology superpower
4. Developing resilient space capabilities and services

[32] the Government is also considering feedback to the liabilities, insurance, charging and space sustainability consultation, which sought views on a proposal to develop a long-term space sustainability roadmap

Critically this regulatory review recommends activity which would support these priority outcomes and align to each of the five NSS goals.

National Space Strategy Goals	Space Regulatory Themes	Priority Outcomes
Grow and level up the space economy	Agility	A streamlined, proportionate and responsive space regulatory environment that ensures greater coordination across regulators and government departments
	Growth	A progressive regulatory framework that encourages healthy competition, risk taking investment, unlocks market access and promotes good practice, while driving out irresponsible behaviours
Lead pioneering scientific discovery and inspire the nation	Innovation	A dynamic, responsive regulatory development framework that supports novel and emerging missions and technologies to enable early leadership in nascent markets
Use space to deliver for UK citizens and the world	Accessibility	A coherent, easy to understand suite of primary and secondary space legislation and clear published guidance that all types of organisations can easily interpret and operate under
Protect and defend	National interest	A civil and commercial space regulatory framework that supports UK national security
Protect the values of Global Britain	Safety and Sustainability	A world-leading approach to incentivising sustainable space activities, protecting the space environment, its celestial bodies, and our freedom to act in a safe, secure and sustainable way
	International Partnerships	A multilateral alliance with other established and emerging spacefaring nations, working towards aligned regulatory frameworks and international best practice that prioritise sustainability and smooth cross-border trade.

Recommended actions

In order to realise these priority outcomes, the UK Government, working alongside the space sector and independent regulators, must continue to act with ambition, pace and a clear sense of purpose.

The following 17 recommendations reflect actions that the sector, regulators and government stakeholders firmly believe will have the greatest beneficial impact on the UK space sector:

AGILITY

1. Improve transparency by publishing clear information on roles, responsibilities and relationships of government bodies involved in the regulatory process on relevant government webpages.
2. Clarify government policy and priorities to maximise the space regulator's discretion for responsive and proportionate decision-making, within established boundaries[33].
3. Work with independent regulators to drive out duplication and demands for excess information, and reduce the time, cost, and complexity of the licence application process. This may include:
    - Improved sharing of relevant information – input once, use many times – such as a cross-regulator and government information management approach that enables rapid, controlled assessment of licence applications, transparency to applicants and a single portal approach to sharing and communicating across stakeholders.
    - Exploring if efficiencies could be achieved by ensuring statutory consultees are relevant to the licensed activity.
4. Support the establishment of domestic and international cross-regulator associations, where appropriate, to enable greater clarity and coherence across shared regulatory interests.
    - This should include a clear map of roles and responsibilities across various government and regulatory interests, linked to relevant legislation and regulation and signposting adjacent or applicable laws and guidance.
    - It would also establish clearer links between government regulatory policy leads and academia, engineering and research professionals and professional services providers to accelerate the development of emerging policy thinking.
    - It should explore similar models from other sectors e.g. Nuclear.

[33] We will work to ensure this collaborative approach avoids impacting the statutory independence of the primary space regulators, CAA and Ofcom.

INNOVATION

5. Establish a regulatory toolkit via sandboxes, testbeds or other innovative approaches that can target support to new mission types and UK access to nascent markets. Support regulators, where appropriate, to update regulations, taking into account emerging market opportunities.
    - The first sandbox should target Rendezvous and Proximity Operations (RPOs) to support the development of the In-Orbit Servicing and Manufacturing market.
    - It should develop tools that provide a safe space for government, the sector, and the regulator to mature collective understanding of the requirements needed to support innovation and novel applications.
    - The outcomes of this can then inform any future sandboxes e.g. lunar, in situ resource utilisation and other Beyond Earth Orbit missions.
6. Publish clear government policy and guidance, signalling on our future intent and priorities in emerging priority areas such as artificial intelligence and quantum technology. Provide clarity to regulators and the sector and de-risk development of UK capabilities in Earth orbit, around, and on, the Moon and beyond.
    - Clarity on our policies regarding Post Mission Disposal times, Dark and Quiet Skies, Space Situational Awareness, collision avoidance and planetary protection including resource use are key areas for the sector and regulators.

GROWTH

7. Reward responsible space system developers by identifying potential financial tools, incentives and market access schemes that promote sustainable activities and in turn encourage self-investment, inward investment and support a level playing field for UK companies.
    - Any market access scheme should discourage a regulatory race to the bottom by creating an ambitious target for sustainability requirements linked to international best practice.
    - Incentives and financial tools could include exploring bonds, targeting debris credits and variable liability schemes. Any schemes would be subject to a rigorous assessment process and Treasury approval and must ensure not to adversely impact the competitiveness of the nascent UK launch offering.
    - Any outputs should join up with the delivery of the recently published Space Industrial Plan’s Access to Finance ambition to unlock London as the leading global space finance hub.
8. Deliver a communications campaign to sharpen government and private sector messaging on our forward leaning, incentive-driven approach to UK space regulation for prospective inward investment and onshoring entities, demonstrating the competitive advantages of operating in the UK.

INTERNATIONAL PARTNERSHIPS

9. Deliver a diplomacy package, drawing on the Integrated Review[34], that works with established and emerging spacefaring nations, international partners including the UN and wider industry, to build a multilateral alliance focused on space regulation which enables smooth cross-border trade and boosts growth. It should:

    - Develop best practice with international partners that enables emerging technologies, novel missions and innovative applications. Engage spacefaring and emerging spacefaring nations to agree mutual recognition of responsible national regimes, alignment of regulations where appropriate, and influence approaches on key areas such as space sustainability, while actively discouraging a regulatory race to the bottom.
    - Agree an approach to linking domestic initiatives that secures broader global adoption, using international platforms such as UN COPUOS to accelerate improvements to global standards. Business friendly, proportionate regulations will be needed to enable commercial operators to continue investing in space in the UK with the confidence that they can access opportunities globally.
    - Work bilaterally and multilaterally to encourage guidelines, standards and other approaches that support growth, innovation, sustainability, and security, and that lead the global agenda in developing best practice to enable emerging technologies in Earth orbit, the moon and beyond.
    - Maximise UK leadership in international fora, including the UN COPUOS, to position the UK as a leader in space regulation, encourage adoption of sustainability guidelines and to promote the peaceful use of outer space.

SAFETY AND SUSTAINABILITY

10. Define space sustainability and publish UK policy guidance for best practices, providing greater clarity of government future directions.

11. Publish regulatory guidance for the development and adoption of sustainability standards in our domestic framework.

    - This guidance should accommodate initiatives developed in other responsible national regimes and allow industry to align its development practices with the requirements of global markets.

[34] https://www.gov.uk/government/publications/global-britain-in-a-competitive-age-the-integrated-review-of-security-defence-development-and-foreign-policy

ACCESSIBILITY

12. Evaluate the benefits and risks associated with targeted amendments to spaceflight legislation, including those identified from the Spaceflight Industry Act Review (Annex A), such as consideration of the potential to merge, refocus or realign the applicable Acts.

13. Deliver a programme of continued regulatory improvement to provide clarity to industry and refine, amend, and update the supporting Space Industry Regulations[35], as required.

14. Conduct a cost-benefit analysis for government of licensing entities with no financial or developmental interests in the UK, its Crown Dependencies or Overseas Territories.

NATIONAL INTEREST

15. Update Earth Observation Data Security policy, and wider space data security regulations, to enable equitable market access whilst preserving UK security interests.

16. Ensure national security and national interest considerations are appropriately and proportionately embedded in all licensable space activities, including for space spectrum, orbital and beyond Earth orbit activities and launch, and develop clear policy guidance on the applicability of the regulatory environment to government-sponsored space activities, including exemptions where applicable.

17. Create appropriate and proportionate requirements for the security and protection of space systems, both for the control of the end-to-end system and of payload services and their data.

Taken alongside wider cross-government regulatory activity (Annex B), these initiatives have the potential to rapidly evolve our regime in a range of targeted areas to support pro-innovation regulation, deliver efficiencies, enable the UK to remain a competitive, attractive place to do space business and **demonstrate our commitment to leadership in space regulatory reform.**

[35] the Space Industry Regulations 2021 make provision to enable the licensing and regulation of spaceflight activities, spaceports, and range control licences services in the UK.

Implementation and next steps

Implementing these recommendations will require support from across government, regulators, and the space sector. The activities will have varying delivery timelines and milestones. There has already been significant progress made towards achieving the review's priority outcomes, including securing funding for a space regulatory sandbox over the next two years. But whilst some activity can be achieved rapidly, others will require longer term resourcing and prioritisation to build on this review.

To deliver the key findings of this report we recommend the establishment of **a cross-sector implementation team, facilitated by DSIT and accountable to the National Space Board (NSB)[36]**. The team should oversee workstreams assigned to deliver each priority outcome in this report and consist of stakeholders from across government, independent regulators, and wider partners. See Annex D for accountable leads who will facilitate these workstreams and the wider governance framework we will adopt.

This is an ambitious approach, but one we firmly believe will deliver the best results. Given the need to protect the independent role of our regulatory bodies, manage the burden on our industry, academic and research partners, and secure resources across government stakeholders, we must take a phased approach to delivery. Balancing ambition with our capacity to deliver is critical if we are to maximise value for the taxpayer, the sector and all those who stand to benefit from a thriving space economy.

The complexity of managing these many variables and equities will not deter us from the task, but we will take clear, planned steps to ensure we deliver the benefits achieving these outcomes should deliver.

Delivery plans should be developed in partnership with:

- Space sector industry bodies, finance experts, insurance brokers and underwriters, to design the optimum conditions for accessing our world leading finance products, develop improved risk analysis tools, and design new insurance products to address the exciting potential of 'New Space'.
- Our world leading scientists and academics, to improve our understanding of the impacts of excessive orbital loading, re-entry of space objects into the Earth's atmosphere and the prospect of space exploration and resource utilisation from celestial bodies. Further, to realise the benefits of the responsible adoption of critical technologies such as artificial intelligence and machine learning, quantum technologies and advanced communications.
- Our independent regulators and cross-government stakeholders, to build on the UK's existing regulatory strengths and experience as a responsible spacefaring nation; driving further on efficient and agile regulation, clarity, and coherence to deliver the most competitive lived experience of any regulatory framework.

[36] This team will be aligned to existing membership of the Space Environment Workstream, a cross-government team tasked with delivering associated National Space Strategy commitments.

- Our international partners, to continue to develop international agreements within the UN and the Artemis Accords, including guidelines and best practice on, safe, secure, and sustainable space activities, responsible space behaviours, spectrum and orbital management and effective space traffic coordination.

Working at pace on these targeted areas we believe this partnership can prioritise and give effect to those actions that we have the capacity, confidence, and support to deliver.

Approach

Workstreams comprising of government, industry and regulatory bodies will set out the most effective ways to assess impact and deliverability and prioritise and resource each recommended action to better achieve each priority outcome.

Implementation will be in three phases as outlined below, each with clear deliverables and approval criteria to be endorsed by the proposed governance structure.

Phase 1 – Assessment and Prioritisation

As part of the assessment phase, further analysis will be applied to the 17 recommendations of this review. The analysis will determine the extent of the impact these actions will deliver against their intended priority outcome, and whether the actions are achievable and timely. The proposed actions will subsequently be prioritised for rapid delivery, should resource allow. Assessment criteria will include:

- Impact assessments – qualifying and, where possible, quantifying the specific impact of the recommendation in delivering the outcome
- Resource requirement assessment
- Risk, including deliverability
- Public Sector Equality Duty appraisal, Environmental Duty, and other mandatory or relevant tests
- A wider review of emerging priorities resulting from the Space Industrial Plan and any other relevant initiatives to ensure join up

Phase 2 – Action Plan Design

The design phase will build on the outcomes of Phase 1 to work with stakeholders from across the space sector and government to agree resource allocation to tasks, decision points, delivery targets and any significant milestones. The action plans for these activities will be designed to factor in:

- Clear tasks, milestones, and activity pathways – with clearly signposted leads
- Regular opportunities to engage with external stakeholders as appropriate
- Monitoring and evaluation processes and frameworks including clear metrics of success

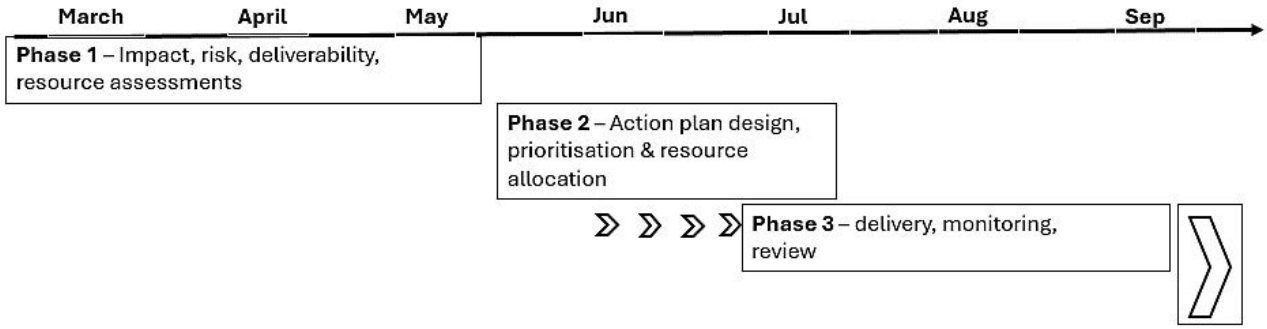
- Terms of Reference emphasising effective partnering arrangements. They will also address the demand for greater inclusion of academia and scientific research bodies into the delivery of the priority outcomes, including through the establishment of 'critical friends' to offer scrutiny and advice on planned actions.

Phase 3 – Delivery and review

Delivery will be conducted in partnership with all relevant stakeholders. The delivery phase will include responsibility for any procurement (where relevant), reviewing and measuring effectiveness, including continuous assessment of deliverability, applicability/relevance, timeliness, monitoring success and retaining focus on the outcomes.

We will make use of the existing governance structure for enabling delivery of the National Space Strategy and monitor progress via the National Space Board, and the inter-ministerial National Space Council as appropriate.

Indicative Implementation Planning Timeline



Annexes

Annex A: Department for Transport - Space Industry Act 2018 Review

1 Introduction

1.1 The Space Industry Act 2018 (SIA) regulates space activities, suborbital activities and associated activities carried out from the UK. The Act partially came into effect on 26 November 2018 with the majority of the remaining provisions coming into effect on 29 July 2021 alongside the Space Industry Regulations 2021 (SIR) enabling the Civil Aviation Authority (CAA) to start receiving licence applications. In line with government best practice a review of the legislation has been undertaken after five years of it coming into effect to assess whether the Act fulfils its intended requirements, whether there are any unintended barriers or gaps in the legislation and whether there are any possible opportunities for de-regulation.

2 Review Process

2.1 The SIA review included a series of nine virtual workshops across government in September 2023 to consider, discuss and collect evidence from government departments and agencies with a direct interest in spaceflight activities. In addition, evidence was taken from a set of industry workshops organised by the Department for Science, Innovation and Technology (DSIT) as part of the wider Space Regulatory Review.

2.2 Evidence from these workshops was used to formulate a series of questions which were uploaded onto SMART SURVEY from 27 November to 22 December 2023 and shared with a range of external stakeholders including members of the Space Safety Regulatory Council and the CAA's Space Launch and Orbit Group to feedback their experiences of working with the Act, the impact for their business and an opportunity to make suggestions for improvement.

2.3 The SIA review took into account the outcome from the lessons learnt exercise following the UK's first attempted orbital launch by Virgin Orbit from Spaceport Cornwall on 9 January 2023[37].

2.4 The SIA review also took account of DfT, UK Space Agency (UKSA), DSIT and CAA experience of delivering the licensing process since its inception in July 2021.

2.5 Following the fusion of all the information gathered, a summary of the evidence, issues identified, and next steps were presented back and agreed with industry at

[37] https://www.gov.uk/government/publications/uk-pathfinder-launch-lessons-learned-report/pathfinder-launch-lessons-learned-report-html

the DSIT Space Regulatory Review workshop on legislation and regulation held on 15 February 2024. This is summarised here.

3 Summary of Evidence

3.1 Overwhelming evidence received from those that engaged in the review process, both from the space sector and government departments, is that, as a framework piece of legislation, the SIA is performing well. It provides a solid foundation, which supports safe access to space from UK spaceports, and orbital missions, whilst allowing for innovation and growth. It is sufficiently future proofed to meet the demand from a rapidly evolving sector, including for new and emerging orbital mission types such as rendezvous and proximity operations and in-space manufacturing as well as lunar missions, hypersonic and point-to-point transport to name but a few.

3.2 But that does not mean that the SIA is perfect, there is always room for improvement. Using collective evidence from a range of sources, a range of outcomes have been identified. Our initial analysis suggests that there are some changes that we can consider to the legislative framework that may deliver some early benefits to industry. We will need to work with industry to develop these ideas assuming the legislative timetable allows for this.

4 Key priorities identified

4.1 Paragraphs 4.1.1 to 4.2.5 set out some initial issues for consideration and we will work with industry to identify priorities as part of the next stage of this work.

4.1.1 Industry raised concerns about some of the terminology and some of the definitions in the Act. For example, licence applicants are asked to demonstrate that the risks are managed to “as low as reasonably practicable” (ALARP). The challenge for industry is to understand the term “acceptable” in s.9(4)(b) SIA as this was considered unclear and subjective. This uncertainty adds costs, time and delay for applicants negotiating the licensing process. We will explore ways to address this issue and provide clarity.

4.1.2 Evidence provided by industry suggests that if the UK wishes to be competitive compared to other countries, then the UK Government and regulator would need to do all they can to keep licensing costs to a minimum. We will explore opportunities with the regulator to reduce the regulatory burden where possible in ways that do not diminish the current safety thresholds.

4.1.3 Industry wants a more streamlined and economical licensing process that provides greater transparency on the progress of applications in the licensing process and the government’s role in the CAA’s statutory consultation on draft licence conditions and consent. We will, with the regulator look at the merit to providing greater transparency where possible.

4.1.4 It has been identified that the Space Accident Investigation Authority (the AAIB) has insufficient powers in certain circumstances to investigate a launch where an accident occurs outside the UK. In addition, it became apparent in the Virgin Orbit investigation there was an issue with the sharing of information between the US and the UK. In respect of the first issue, we will consider this further when the Spaceflight Activities (Investigation of Spaceflight Accidents) Regulations 2021 are reviewed in 2026. We will progress discussions with the US at the earliest opportunity to address the information sharing.

4.1.5 UKSA and DSIT highlighted through the review a wish to explore the current approach to “procurement only” licensing for payloads on UK launches, where the satellite will not be operated in the UK or by a UK entity, to ensure the regulatory approach is proportionate and effective.

4.1.6 The UK Government may consider exploring the merging or refocussing of the OSA and the SIA into a single framework for space activities. We will undertake analysis to explore the merits of doing this, including the feasibility of transferring the licence fee powers under the OSA to the CAA.

4.1.7 Evidence suggests that a lighter touch approach to suborbital launches will allow the UK to compete globally for more business in this area for example sounding rockets. This is a complex issue to address as it may require changes to primary and secondary legislation, but we will develop policy options on this issue.

4.2 Issues identified for consideration in the longer term included:

4.2.1 The UK Government identified there is a narrow scope to create byelaws at spaceports. Government will take another look at the powers to make byelaws.

4.2.2 Although we have not yet had an appeal, officials have identified that the SIA Appeals process is potentially difficult to manage, and we are looking to streamline the process.

4.2.3 The UK Government has set out an ambitious agenda for sustainability. We recognise that the SIA does not currently address this, and we will consider whether further changes to the SIA are necessary as the policy evolves, including clarity on the definition of sustainability.

4.2.4 Higher Education research and development organisations would like to see changes to current definitions of rocket in scope of the Air Navigation Order 2016. The UK Government will consider the potential impacts from a public safety perspective.

4.2.5 There remain some provisions of the SIA that have been partially or not commenced and we will review.

5 Next steps

5.1 Government and CAA are already taking a number of steps to improve the regulatory framework and their internal processes to drive improvements for the sector. This includes supporting the Space Industry (Indemnities) Bill, a Private Member's Bill about indemnity limits, currently before the House of Commons. A further example of progress being made to resolve issues identified during the review include, DfT officials working with Ministry of Defence (MOD) policy officials on a potential legislative solution where the MOD had identified an unintended consequence relating to the SIA which impacts their ability to support military activities. Additionally, UKSA officials are also exploring whether to exempt from the procuring, a launch licensing requirement for UK payloads to be launched from space stations under both the SIA and Outer Space Act 1986 (OSA).

5.2 Government wants a successful UK space industry and recognises it is important to get the legislative framework correct. The SIA review has provided an opportunity to investigate the scale and nature of the regulatory landscape and identified issues for further consideration. The proposals are being considered and further work conducted to explore options to develop the SIA review Implementation Plan. We anticipate that most of these proposals if taken forward are unlikely to require amendments to the Act and could be addressed through ways of working and guidance. However, some of the proposals could require secondary legislation. We will share the Implementation Plan with industry at the earliest opportunity. Note that we will conduct the Space Industry Regulation 2021 Post Implementation Review in 2026 and will use the evidence gathered to inform this.

Annex B: Current space regulatory, legislative, and related initiatives across government

The DSIT-led targeted review of the space regulatory framework will take into account parallel planned government activity on space regulation, legislation, and related initiatives, including:

1. The delivery of the Plan for Space Sustainability announced in June 2022 including the development of sustainability standards and alignment with the Astra Carta initiative to position the UK as a global leader in setting industry standards supported by other space nations. [DSIT/UKSA/Industry]
2. A review in 2023 of the regulatory frameworks governing orbital activities. [DSIT/UKSA]
3. The delivery of a variable insurance and liabilities approach as set out in the Government's response to the Vallance Review. [DSIT/UKSA]
4. A cross-government review of the Space Industry Act in 2023, in line with its five-year anniversary to ensure we keep leading the world in modern space regulation and setting a global benchmark – supporting innovation and unleashing the UK as a science superpower. [DfT]
5. Ensuring lessons learnt from licensing the first spaceport and launch in the UK are taken forward as appropriate to enable the UK to become the leader in commercial small satellite launch in Europe. [UKSA/DfT/DSIT/CAA/MOD]
6. Working closely with the US and other partners to minimise bureaucracy and duplication in our licensing of space launch systems. [DfT/CAA]
7. Working with our international partners and in multilateral forums such as the Inter Agency Space Debris Co-ordination Committee, the UN Committee on the Peaceful Uses of Outer Space and Artemis Accords to champion best practice in space and open markets for emerging technologies. [UKSA/DSIT]
8. Stood up a Planetary Protection Advisory Panel in February this year, to ensure UK-led missions to the Moon and other celestial bodies avoid harmful contamination as we develop our approach to regulation for lunar missions. [UKSA]
9. Leading debate in the United Nations First Committee on the promotion and adoption of Responsible Space Behaviours, to avoid misunderstanding and miscalculation, prevent an arms race and avoid conflict. [FCDO]
10. Taking forward the new strategic vision and principles for spectrum policy, with a focus on innovation in the use and management of spectrum to maximise its availability and value to the UK, as set out in the Ofcom Spectrum Strategy[38] (2021). We will work with Ofcom (regulator for spectrum management) to ensure that the national spectrum licensing and orbital filing co-ordination frameworks reflect UK's strategic and security considerations and more widely position it as a

[38] https://www.ofcom.org.uk/data/assets/pdf_file/0017/222173/spectrum-strategy-statement.pdf

leading place for investing in, developing, and delivering space technology and services. In these frameworks; our wider policy approaches; and in our engagement with international standard setting and regulatory fora, we can work to support sustainability and other strategic priorities in space. [DSIT/OFCOM/MOD]

11. The Government is supporting a Private Member's Bill to make a limit on an operator's liability under section 36 of the Space Industry Act a mandatory requirement in operator licences.

Annex C: Methodology

Overview

The Space Regulatory Review mandate was to deliver a targeted set of recommendations and priorities for the future regulatory environment of the space sector. The Terms of Reference identified three significant areas to deliver:

1. Identifying gaps and opportunities in the current and planned space regulations and provide targeted recommendations for improvements.
2. Apply the strategic priorities of space safety, security, sustainability, and growth in all current and future space regulation initiatives.
3. Support the national objectives of maintaining the UK as a global science superpower and a global leader in modern, agile, sustainable space regulation.

The Space Regulatory Review has been structured into four phases:

1. Setting and agreeing scope and mandate
2. Evidence gathering
3. Assessment and conclusions
4. Recommendations, report and implementation plan

Although DSIT co-ordinated this review it was a collaborative cross-government endeavour with contributions and advice from various departments and regulatory bodies in particular DfT, DBT, MOD, UKSA and core regulators – CAA and OFCOM.

The review has gathered evidence through internal interview and extensive engagement with the space, finance, and insurance sectors. The work has brought coherence in many standalone strands, including space spectrum regulations, lessons from the first launch, insurance and liabilities consultation, legislative review, and independent review into critical technologies.

Project Phase

Phase 1: Framing and Mandate (March to August 2023)

Confirm ministerial mandate for the review; determine initial review topics and questionnaires/interview guidance and develop terms of reference for the review.

Ministers confirmed the review should be targeted, focussing on areas with the highest potential to deliver the goals of the NSS and to maintain relevance in this rapidly changing sector. The review would identify gaps in existing or imminent regulatory improvements, avoiding duplication whilst exploring the highest potential areas for future development.

Phase 2: Evidence Gathering (September to December 2023)

Data and publication review, engagement and interviews with industry, academia, delivery agencies; senior officials, and experts; gap analysis; peer nation framework review.

The review initiated a publication and data review of government held regulatory priorities before engaging broadly across government stakeholders, including members of the National Space Board (NSB). These engagements were designed to understand government perspectives, priorities and discern areas where regulation could improve government's ability to deliver against the strategic goals. They were also to identify areas stakeholders thought the review could focus on when engaging with the wider sector.

Following this the review team established an introductory workshop with leading industry bodies to set out the aim and scope of the review, describe the approach to be taken and secure support from industry, academia, and adjacent sectors. This initial workshop informed the topics covered in the subsequent engagements with the sector below:

Workshop 1: Enabling Novel Missions (e.g. RPO, IOSM, SBSP, Cis-Lunar/ISRU (Innovation), 02 November 2023. Venue: Harwell

Targeted at companies and academia with an interest in developing novel missions, utilising innovative regulation tools (such as sandboxes) and targeting 'first to market' opportunities.

Workshop 2: Enabling access for all (innovation/sustainability), 07 November 2023. Venue: Space Park Leicester

Innovation and sustainability – scientific research access to space, sustainability for other space users, innovative approaches to spectrum sharing – aimed at academia, large constellation operators and small CubeSat technology demonstrators/scientific sensor teams.

Workshop 3: Improving current regulations/legislation environment (Growth), 08 November 2023. Venue: Edinburgh

Explored the current environment and the lived experience of seasoned operators and emerging space sector actors – what works, what doesn't? Are there better examples in other regimes? What is blocking your ability to provide services/access markets?

Workshop 4: Improving current regulations/legislation environment (Access), 29 November 2023. Venue: London

Explored the accessibility of the current licensing and regulatory regime, the structure of government, and the validity of the current primary legislation through the Post Implementation Review of the SIA 2018. Audience included licensing and legal experts and regulation advisors.

Workshop 5: Growth and competitiveness (Growth), 30 November 2023. Venue: London

Ideas and opportunities to make the UK sector more competitive and attractive to both foreign inward investors and the wider finance community and ESG focussed actors – target audience included Business Development teams, finance teams and representatives from finance and academia.

Workshop 6: Protect and defend (National Security), 16 January 2024. Venue: London

This workshop explored what steps we must take to ensure our freedom to act in a safe, secure, and sustainable manner free from external influence.

'Meet the Team' face to face sessions at the UK Space Conference in, Belfast during November 2023, and virtual meetings. These sessions enabled one to one conversations with individuals and companies from across the sector, including academia, industry, and professional services representatives.

Foundational questions

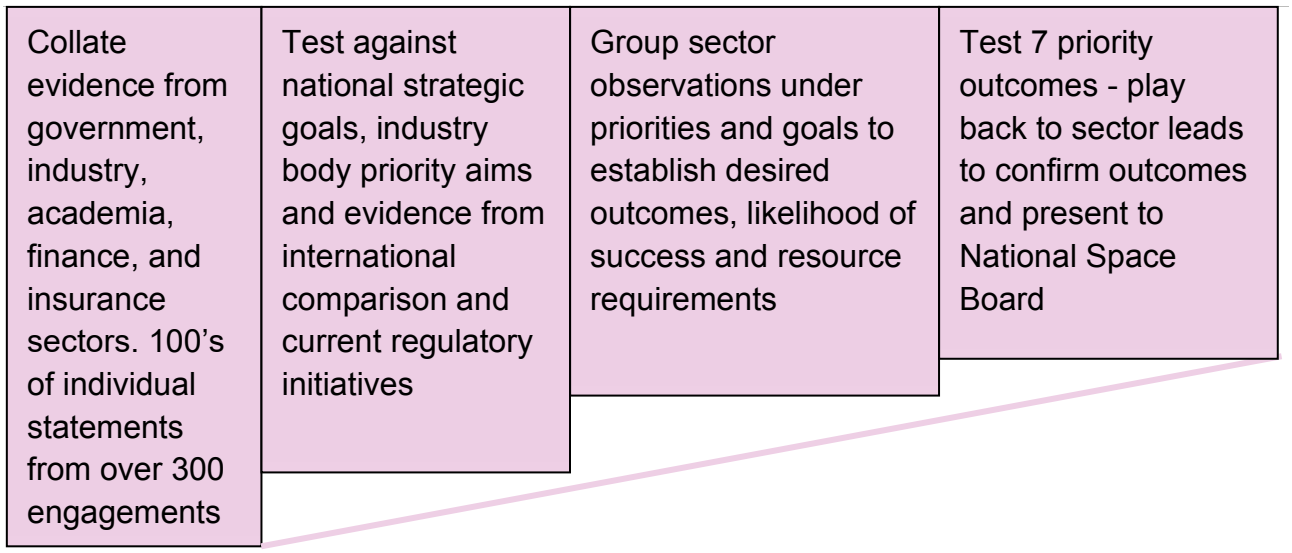
The core questions that were commonly considered throughout the evidence gathering process included:

- What would be the single most effective change to space regulation that would move your business forwards?
- What are the most significant regulatory blockers to your growth plans?
- What are the levers to gaining UK space sector access to global markets?
- What behaviours are of greatest concern to your orbital operations today?
- How does operating in the UK compare with other national regimes – and what best practice would you recommend?

Phase 3: Analysis and conclusion (November to December 2023)

Characterise, grade, and prioritise evidence; evidence assurance; test assumptions; bias and challenge session; draw up preliminary conclusions and issue interim report.

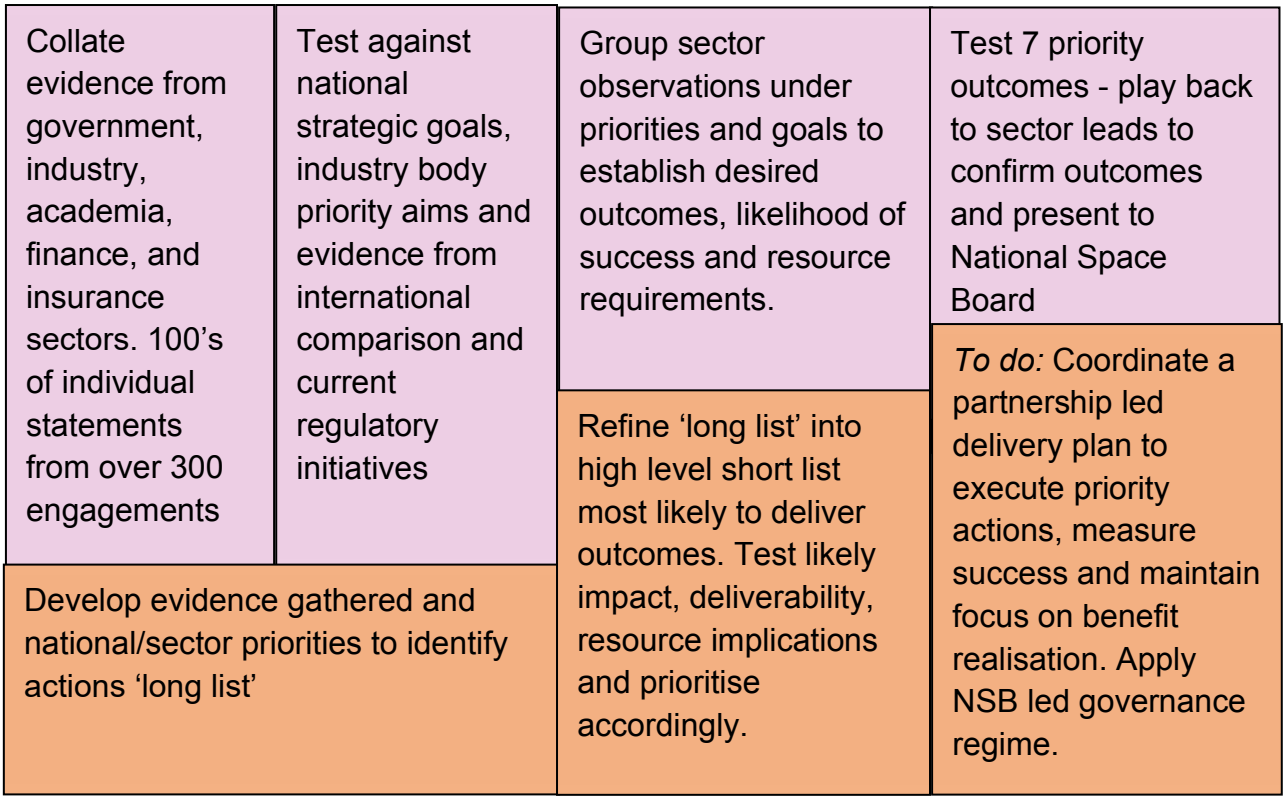
In this phase the evidence gathered was compared to sector priorities shared by industry bodies and government/sector coordination groups, the strategic goals set out in the National Space Strategy and ongoing initiatives underway in the regulator bodies. Evidence was grouped under thematic areas and the priority outcomes identified that would most likely to meet the goals of both the sector and government. **These priority outcomes were then tested with the sector and across government.**



Phase 4: Recommendations and Priorities (January to March 2024)

Draft final report; identify deliverables, priority outcomes; recommendations for implementation plan and publish final report.

This phase included another series of workshops, this time focussed on categorising the evidence and developing a long list of actionable activities that could contribute to the agreed priority outcomes. These actions were then further consolidated, and a series of priority 'short list' actions developed that were considered most likely to have the required impact, deliver the expected benefits and that were most likely to be achievable within current resource and in a timely manner. A preliminary risk assessment was conducted to capture potential risks to delivery.



Annex D: Implementation Accountability Table

Space Regulatory Theme	Priority Outcome	Recc No	Accountability
Agility	A streamlined, proportionate, and responsive space regulatory environment that ensures greater coordination across regulators and government departments	1-4	**Lead: DSIT/DfT** Partnership working between government (DSIT, DfT, DBT and MOD), UKSA, industry, academia, and regulators (CAA and Ofcom)
Innovation	A dynamic, responsive regulatory development framework that supports novel and emerging missions and technologies to enable early leadership in nascent markets	5-6	**Lead: DSIT/UKSA/DfT** Partnership working between government (DSIT, DfT, DBT and MOD), UKSA, industry, academia, and regulators (CAA and Ofcom)
Growth	A progressive regulatory framework that encourages healthy competition, risk taking investment, unlocks market access, and promotes good practice, whilst driving out irresponsible behaviour	7-8	**Lead: DSIT/UKSA** Partnership working between government (DSIT, DfT, DBT and MOD), UKSA, industry, academia, and regulators (CAA and Ofcom)
International Partnerships	A multilateral alliance with other established and emerging spacefaring nations, working towards aligned regulatory frameworks and international best practice that prioritise sustainability and smooth cross-border trade.	9	**Lead: DSIT/UKSA** Partnership working between government (DSIT, DfT, FCDO, DBT and MOD), UKSA, industry, academia, and regulators (CAA and Ofcom)
Safety and Sustainability	A world-leading approach to incentivising sustainable space activities, protecting the space environment, its	10-11	**Lead: DSIT/UKSA** Partnership working

	celestial bodies, and our freedom to act in a safe, secure, and sustainable way		between government (DSIT, DfT, DBT and MOD), UKSA, industry, academia, and regulators (CAA and Ofcom)
Accessibility	A coherent, easy to understand suite of primary and secondary space legislation and clear published guidance that all types of organisations can easily interpret and operate under	12-14	**Lead: DfT/UKSA** Partnership working between government (DSIT, DfT, DBT and MOD), UKSA, industry, academia, and regulators (CAA and Ofcom)
National Interest	A civil and commercial space regulatory framework that supports UK national security	15-17	**Lead: UKSA/DSIT** Partnership working between government (DSIT, DfT, DBT and MOD), UKSA, industry, academia, and regulators (CAA and Ofcom)

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