

:: DELIVERY PLAN

2020.

A World Empowered by Space



We work with
Innovate UK

CATAPULT
Satellite Applications

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The Power of Space



The UK has set an ambitious vision to grow its space sector to £40bn by 2030, supporting 100,000 jobs. The sector is already on course to hit this target, growing in 2017 to £14.8Bn, with 41,900 employees and at the end of 2018 was made up of 948 organisations.

The start of this year has seen the extraordinary impacts of the COVID-19 crisis. At the moment we need to focus on working together to deal with the health crisis at hand. However, both now, and when the priority becomes an economic one, space is a key part of the solution.

The two universal trends that are driving the new digital space economy are the opportunity for satellite applications are Geospatial Intelligence and Ubiquitous Connectivity. From what we have seen during the crisis, it is clear that these will become more embedded and help us thrive in a post-COVID world.

- Geospatial technologies and data are underpinning decision-making processes in both Government and business and are increasingly recognised as key in helping to mitigate climate change
- Geospatial solutions, will help us manage our supply chains, our assets and our lives in more effective ways
- The satellite communications market is in an exciting period of reshaping. Our dependence on communications is growing and the benefits have been amply demonstrated during the efforts to address the pandemic.

The demand for satellite-enabled services is supporting the development of many advances in upstream space on which the UK can capitalise. The UK now has spaceports in development in Scotland and Cornwall, and leading launch companies in Orbex, Lockheed Martin, Reaction Engines, Virgin Orbit and Skyrora. With advances in AI and robotics, new opportunities for ambitious initiatives to address energy solutions, connectivity and life sciences are also within reach.

It is a time for big thinking, innovation and global cooperation, with the aim of driving exponential benefits for the planet. Activities and interest in space are building to the point where it is critical to our sustainable future. The further our activity pushes into space, the greater the solutions and benefits that can be realised.

Why the Satellite Applications Catapult?

The Satellite Applications Catapult is a unique innovation and technology company which boosts economic growth and productivity by helping organisations harness the power of satellite-based services.

We work with businesses of all sizes to realise their potential from space infrastructure and its applications. By connecting industry and academia, we get new research off the ground and into the market more quickly, and we help organisations make use of and benefit from satellite technologies, bringing together multi-disciplinary teams to generate ideas and solutions in an open innovation environment.

- We build demand for space-enabled service providers that use space data and offer solutions to end customers in sectors ranging from transport to climate and environment.
- We build demand for data from data and connectivity providers through new services and interventions to improve ease of access and use.
- We create a need for new services and data from space and enable trial and commercialisation of new satellites to deliver this for existing and new space and satellite hardware manufacturers.
- We enable innovation and supply chains for new space hardware and new hardware on the ground to enable access to space, in support of payload and component manufacturers, space and satellite hardware manufacturers and launch providers.
- We drive commercial and technical innovation and ambition to create the next generation of services in and from space.

HERE ARE SOME EXAMPLES OF OUR WORK:



FORESTMIND

We will demonstrate how satellite-enabled solutions can map and help reduce deforestation within global supply chains. This will unlock industry-led commercialisation of products and services.



TAILINGS DAMS

Up to 50 tailings dams will be monitored globally using remote sensing data products and services.

This service will be tested on the investor community and opened up to industry to deliver an independent global tailings portal.



LIVING LAB

We will demonstrate an Ambulance Living Lab capability to prove the business case for improved efficiency of emergency response.



DFID IMDP

DFID Framework agreement to use satellite imagery to respond to disaster recovery will lead to new services for remote monitoring.

Derived information is used for humanitarian benefit.



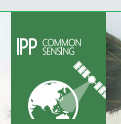
SUSTAINABLE FINANCE

Building supply chains with space and financial service providers

Creation of the first open-source asset-level dataset for cement and steel industries as there are open asset level datasets out there.



COMMON SENSING



We are championing the conversation around global climate change and small island developing states.

Our 'Turning the Tide' content series in association with Devex was a first step in our partnership to build a climate-resilient future.



MOBILISING FOR LAUNCH

Creating new mission capabilities enabled by our IOD programme. Companies can trial services and the UK can prove the international demand for new satellite data products.



5G CONNECTED CITY

An exciting new 5G testbed is integrated into Milton Keynes as a smart city network.

Companies will conduct testbed trials to validate health and energy use cases and innovations with 5G technology.



CONNECTED VEHICLES

Establishing a prototype to globally connect 'users on the move' at high speed and low cost. New commercialisation opportunities from novel antennae solutions will lead to new products and services.

What We Do

Working with the wider network of Catapult centres, UKRI, the European Space Agency, and many other space-sector organisations, we shape programmes and interventions that can create real UK advantage and open new economic frontiers. This is achieved through work that actively creates and shapes markets, engages with other sectors and encourages investment from both international partners and private finance.

We work with partners to develop key space-specific solutions with a focus on the communities and applications related to the two key application areas that space enables - Geospatial Intelligence and Ubiquitous Connectivity. Alongside this, our business value streams exist to energise their respective markets, building demand for satellite applications in sectors such as Agriculture, Extractive Industries, Health & Wellbeing and Intelligent Transport.

We are also doing more in space, raising the ambition of the UK to achieve the government vision for space as an industry of the future through our work in our 'Access to Space' team which includes in-space servicing, manufacturing, UK launch and other elements of 'upstream' space.

Part of this are our Disruptive Innovation for Space Centre (DISC) and Westcott initiatives which combine with our regional cluster developments to demonstrate the value that shared facilities and capabilities can offer. (see pages 12-15)

In addition, we work to support UK businesses to grow through tailored packages of business support, and through our regional development activities we bring disparate sectors together that can set the UK apart.

For more information on activities in each of our focus areas please see the following pages, which also include contact details for our leads in each area.



Agriculture

Vision Statement

UK businesses demonstrate how satellite-enabled technology can drive change in agricultural value chains to support a more globally resilient food industry.



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Sustainable supply chains: We are building confidence and demand for satellite enabled solutions to monitor the growing global concern around environmental impacts in supply chains. We will be engaging major global retailers and then bringing together leading UK consortia to determine solutions in areas including deforestation, water usage and carbon.

Our initial focus is ForestMind, a two-year project funded by ESA and working with companies including Sainsbury's, M&S and Waitrose. It will create an operational demonstrator to monitor deforestation in UK retailer's global supply chains.

Production intelligence: Our activities enable UK satellite enabled service providers and researchers to address agricultural production challenges in the UK and overseas. The focus initially is the COLCO project which aims to stimulate an increase in quality and volume for Colombia's Cacao sector.

Opportunities will be realised in linking COLCO with other cacao and agriculture projects in Colombia to open a two-way transfer of technology, research and training interventions into the cacao supply chain.

Digital Agri-Test Centre: Based at Westcott this Centre will develop physical and digital agricultural assets to create a neutral development and innovation space that supports stakeholders (users and suppliers) in developing, exploring and testing satellite-enabled technologies. This will then broaden out to other geographies.

Extractive Industries

Vision Statement

We will lead the development of satellite-enabled solutions to improve the efficiency and reduce the social and environmental impact of mining; leveraging the UK's position as an industrial centre for global mining, to enable the growth of UK companies through product and service exports.



Estel Blay
Head of Extractive Industries

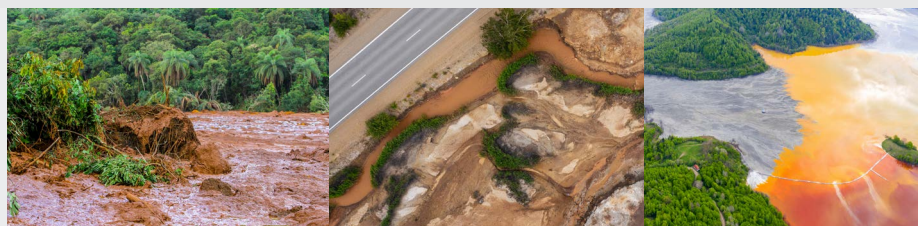


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Environmental Baseline and Monitoring: As initial work around water quality and other environmental issues evolves, we are beginning to look at Illegal mining as a new global problem. We are working with the latest satellite and analytics technologies to monitor the extent of illegal activities, assess their impact and provide meaningful insights to help direct on the ground support.

Creating Operational Efficiency: Our focus is on prospecting for a new method for Lithium extraction as an opportunity for the UK-based lithium industry. There are also new international opportunities developing in Bolivia.

Tailings Dam Monitoring: We have developed an automated system to monitor tailing dam stability and a (risk) monitoring solution. Following the failure in Brumadinho, Brazil has emerged as a strategic country to expand UK capability. A joint intervention by 105 investors, co-led by the Church of England Pensions Board has been established.

MineSense Community: Minesense was launched in November 2019, alongside ESA and the United Nations Interregional Crime and Justice Research Institute. A trusted community is being developed to stimulate direct collaboration between technology supply and demand and the development of innovative space-based solutions to support the mining industry. This community is open to all relevant organisations and runs regular events and engagements.

Climate and Sustainability

Vision Statement

To position the UK space sector as a global driver of actionable climate and sustainability information and services.



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We are combining three complementary programmes that focus on separate user communities and markets which share a joint vision. Integrating sustainability considerations into financial decision-making enables the private sector to address sustainable development challenges leading to long-term sustainable solutions. These programmes use similar underlying data and technologies to serve distinct types of end-user communities (government, development community, corporates) with various market dynamics, maturity and sizes.

Sustainable Finance: Activating the (geospatially enabled) sustainable finance market, building Earth Observation supply chains and activating early adopters and influencers are Catapult's core objectives here. Raising awareness across both finance and space sectors will stimulate demand for our sector in driving Climate action.

Sustainable Development: Through potential partnerships with large multinationals and conservation organisations e.g. WWF, ZSL, we can facilitate conversations that can influence environmental and social benefits and drive commercial growth in the UK space sector.

CommonSensing: As part of a wider consortium for Common Sensing, we are championing the conversation around global climate change and small island developing states. During FY20, we became responsible for delivering the full technical solution and connectivity as we work towards building a climate-resilient future.

International Development Frameworks: In 2019, we secured several development focused framework contracts which allowed us to deploy and embed space technology within the development sector at an unprecedented size and scale. By achieving a trusted advisory status across these frameworks, we de-risk this market opportunity for the UK space sector.

Intelligent Transport

Vision Statement

By 2030 satellite enabled products and services are an integral, trusted component of global intelligent transport systems. The UK is known as a market leader for innovative satellite enabled transport applications demonstrated by much reduced congestion, faster journey times and simpler intermodal transits.



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Connected Infrastructure: Transferring satellite services into Infrastructure applications adopted and utilised by the transport supply chain will support the monitoring of transports assets, enable more cost-effective inspections, and improve air quality monitoring as part of traffic flow improvements. Our first major project, Brigital has delivered an early-warning prototype for potential bridge failure to improve the economics of asset management.

Connected Mobility: Our interventions focus on the future of vehicle connectivity, a key satellite communications opportunity that will allow us to embed satellite

solutions into regional transportation plans.

CASSIS 2: CASSIS will offer a UK delivered compact, light, low-cost, satellite-terrestrial hybrid vehicle terminal based on technology that's scalable. Product integration and lab tests are planned for 2020, with in situ field testing and demonstrations scheduled for 2021.

Future of Flight: We have companies interested in partnering us on the ISCF Future Flight Challenge and aim to secure a £20m project by late 2020. This project will utilise drones for aviation safety purposes, with a focus on connectivity and positioning.

Health and Wellbeing

Vision Statement

The UK will fundamentally change where and how healthcare and wellbeing services are delivered around the world, solving some of society's biggest challenges by delivering cutting-edge satellite-based innovation at scale.



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Remote Healthcare Solutions: Delivering opportunities for Satellite connectivity to manage long-term conditions, prioritising early intervention to reduce delivery costs. These solutions have become particularly important in the response to COVID-19 and we are now developing several opportunities for innovative UK companies in the light of this crisis.

Centre for the Eradication of Bowel Cancer: An exemplar to demonstrate the benefits of satellite connectivity which can then be rolled out to focus on other conditions. A consortium to set up a Centre includes NHS, academia, multiple Catapults, Intel and SMEs. 3-5 hubs created across UK will provide secure environments for data, enabling NHS clinicians to work with health researchers, data scientists, social scientists and the public.

Efficiency of Emergency Services: Remote monitoring/consultation to reduce service delivery costs and alleviate pressure on hospital / GP services.

Health Living Lab: Working to prove the business case for improved efficiency of emergency response, showcasing potential connectivity solutions alongside healthcare technologies across the supply chain.

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Geospatial Intelligence

Vision Statement

To enable UK business and Government to benefit from the rapid increase in geospatial data and associated computing technologies through delivery of expertise and capability that will support growth and development of UK geospatial businesses.



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Earth Observation: We can support businesses by utilising Earth Observation imagery, providing computational capabilities for businesses and academia at an affordable cost.

Facilities: Our SEDAS and CEMS programmes give UK businesses easier, more cost-effective access to leading Earth Observation data sources and a cloud computing environment covering precision agriculture, disaster monitoring, and security among others.

Foundation Capabilities: We participate in the Open Data Cube (ODC) initiative and aim to position the UK as the centre of expertise in application of Data Cube technologies. The intent is to enable export opportunities for Earth Observation service providers to help them to scale through large regional deployments such as 'Digital

Earth Africa' and 'Digital Earth Pacific'.

EO2Go: Through Earth Observation to go, we play a strong role (alongside academia, the private sector, and government including UKSA and Defra) in assisting the UK to develop a strong national capability that delivers high quality interoperable data. This makes Earth Observation data more consumable, increasing user adoption.

AI4EO: We will use AI to augment the extraction of information from EO imagery, helping businesses and government to maximise the use of such images. In FY21 we will promote results of annotated / labelled datasets and publicise our four machine learning use cases with data providers Maxar, Earth-I, ICEYE and Telespazio Vega

Ubiquitous Connectivity

Vision Statement

We will empower a new era of communications and value-added services underpinned by ubiquitous connectivity; capitalising on emerging technologies to drive business cases occurring in key markets and industries for the benefit of the UK economy.



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Strategic Leadership: As an important intermediary we continue to engage as a respected voice to influence government policy and stakeholder perception so 'non-terrestrial' solutions are integrated into communication standards. We play a role at OFCOM forums to facilitate spectrum sharing and re-farming frequency techniques.

Future Systems and Networks: To respond to the UK's ambition to be a world-leader in 5G by 2027, Westcott has been developed as a nationally recognised 5G testbed and 'innovation as a service' capability for the UK's IOT community, to support new integrated services and standards developments.

Pervasive Devices: We will understand the technological building blocks that are key to building 'fit for purpose' devices which address different market segment needs.

Consolidated Smart Networks: We will drive the integration of 5G and new constellations through a series of early stage terminals and systems demonstrators creating new product and services opportunities.

Access to Space

Vision Statement

To grow the community of UK providers of disruptive technologies and innovation in space to produce the framework for a world-leading national supply chain and service exploitation ecosystem. The result will redefine the industry of commercial satellite and constellation operators, mission solution providers and service providers terrestrially, in orbit and beyond.



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IOD Programme: Building, launching and operating satellites still carries significant risk and takes considerable time and resource, which can delay the uptake of the new services they enable. Our IOD Programme enables the demonstration of new capabilities and validation of new products and services to customers. We will continue our programme of launches this year which includes putting two new satellites on orbit.

Manufacturing for Space: The opportunities for economic activity in

space are growing rapidly – we plan to support the acceleration of UK manufacturing and its supply chain capabilities to support new technologies for ground segment, launchers and spacecraft.

Commercialisation of Space: we aim to establish the conditions needed to exploit the opportunities that industrialisation of space offers to the UK. In doing so, we will guide and nurture UK strengths in thematic areas such as robotics, autonomy and AI for on-orbit activities.

Emerging Technology

Vision Statement

To identify emerging technologies from across sectors, enabling the Catapult to forecast and catalyse the exploitation of disruptive technologies. Creating a transformation in space capability, focusing on innovations in communications, smart geospatial systems and advanced manufacturing.



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Future Mega-constellations: We will develop activity around use of Mega-constellations to enable investment in project development, trials and the commercial roll-out of resilient systems in the future.

New architectures for embedded AI: We will publish a strategic roadmap to increase awareness of the opportunity for embedded AI and ML in the apps area. This will include the creation of a testbed with demonstrations of initial case studies. In turn, this will enable cost-effective exploitation of AI and satellite services, delivered by UK companies into multiple market sectors. We will also develop a test-harness for accelerated satellite product prototypes which will increase traction for investment into products using satellite services.

V-band Technology Readiness: We will facilitate the growth of an R&D community focussed on developing and commercialising V-band technologies. Supported by multiple Catapults, this will help prepare the UK industry and supply chain to respond to opportunities from 2021-2025.

11.

Facilities

Vision Statement

By 2030, to have provided ten unique facilities at a range of UK sites and this to have generated £300m GVA and 2000 jobs through scalable Regional Growth and Disruptive Innovation in the Space Sector.



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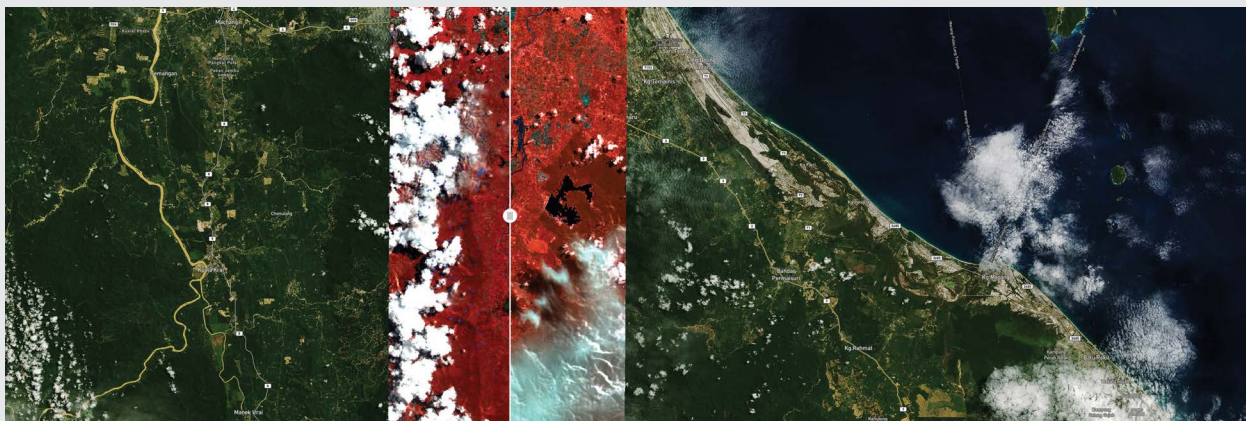
Access to R&D: Access to equipment for advanced space manufacturing is not possible for many SME's with long lead times, costly access and a lack of flexibility. We have developed facilities that support the design, manufacture and testing of products for deployment into complex environments enabling rapid prototyping, the creation of advanced manufacturing infrastructure, and low volume production.

DISC - DISC houses a range of facilities both in Harwell and Westcott, offering end-to-end design, modelling, testing and production equipment in a collaborative engineering environment and will enable teams to take an R&D project from proof of concept through to a full-sized prototype, manufactured at quality levels and scales sufficient to undertake end-customer

validation. The DISC 10-year vision plan for regional expansion is aligned with current space clusters, to accelerate scalable growth in already well-established or developing ecosystems.

Westcott: The Westcott Space Cluster was launched in October 2018, in collaboration with Buckinghamshire Thames Valley Local Enterprise Partnership (BTV LEP), Westcott Venture Park and other stakeholders. The BTV LEP acknowledges the instrumental role of the Catapult in realising the potential of the site and its significance at the heart of the Buckinghamshire Local Industrial Strategy. Through the activities of the Innovation centre, we expect to create 350 high-skilled jobs at Westcott by 2025 and create revenue of £1.1bn EVA.

International Strategy



Enabling exports remains a critical component of the UK's 2030 objectives for space. Our five focus areas are:

1. **Closer collaboration with FCO and DIT:** We will explore opportunities to collaborate with “like-minded” countries for collaborative R&D and mutual market creation, with countries including North America, Europe and the Commonwealth countries, especially Canada and Australia.
2. **Leveraging EASOS and other technologies in accessing international markets:** We will develop relations with global suppliers in markets with the best potential for pulling through UK capability to help commercialise our Earth and Sea Observation System (EASOS).
3. **Explore the opportunities for collaboration, export and inward investment in China:** We will create a centre in the Guangzhou province operational from April 2020 (first phase fully funded by China).
4. **Take the Joint Centre approach to other key geographies:** We have prioritised Australia due to its programme of Collaborative Research Centres. We anticipate taking the Joint Centres model into the Gulf.
5. **Expand activity in Latin America where we already have presence and in-country relationships:** We will expand on the Agri-Tech and Extractive Industries Value Streams in the LATAM area, primarily in Chile, Colombia, Peru and Bolivia.

To find out more about our International activities and how we can help organisations engage with international markets through export opportunities and International CR&D projects please contact info@sa.catapult.org.uk.

Placemaking



To deliver impact both nationally and international, our ambition is to create space clusters and hubs drawing on local expertise and facilities, delivering downstream impacts at scale through significant programmes of activity. We will support the growth of the sector by working with Local Enterprise Partnerships and the Devolved Organisations that cite space and its applications in local industrial strategies.

13.

Centres of Excellence: We will continue to support, grow and evolve our Centres of Excellence (CoE) in partnership with the UKSA.

This commitment enables us to provide national coverage, working with academia, local and devolved government organisations, other Catapults and the business community in each part of the UK. Collectively we focus on local priorities, drawing on resources and expertise, and matching that back to our value streams who can then offer and provide tailored Catapult support to enable business growth. The Centres deliver local skilled opportunities and jobs throughout the UK.

Our partnership with UKSA offers localised links with a broad range of incubators for business acceleration and leverages and supports the ESA Regional Ambassador Programme to provide funding opportunities for businesses of sizes.

Cluster Development: As part of our Place strategy, we are developing cluster approaches based on the model that has developed at Westcott. This brings together advanced manufacturing and end-user needs, aligned to local capabilities and priorities, with interventions like DISC at its heart. Expanding this blueprint across the UK will enable the development of supply chains that will support space ports, downstream applications and major new industries as the space sector industrialises toward the opportunities ahead. The main developments at the Westcott Space Innovation Business Park will include:

- **Westcott Innovation Centre** will provide office accommodation plus a multifunctional and reconfigurable engineering facility designed to support the development of production lines for space hardware and related systems.
- **Westcott 5G Step out centre** will evolve over time to encompass the latest technological advances in telecommunication.
- **The Westcott DISC** will house a range of facilities to support the design, manufacture and testing of products for deployment into complex non-terrestrial environments.
- **The Digital Agri-Test Centre and Health Living Lab** at Westcott Venture Park will be developed in 2020. The Living Lab will allow trial and demonstration of connectivity use cases for ambulances and support the uptake of satellite connectivity. The Agri Test centre will offer a dedicated testing environment encompassing; 5G and the Internet of Things, Robotics, UAV (unmanned aerial vehicle) and satellite technologies to understand the wider agri-innovation ecosystem.
- **The Westcott Business Incubation Centre (BIC)** has already provided support to eight SME's. Feedback from graduation interviews with Valerann, Stratian and LIFT ME OFF has been very positive, particularly in terms of the staff support and technical expertise gained.

Business Support



New businesses are needed to enable and capitalise on the wave of innovation in the space sector. We offer a suite of business support packages tailored to the needs of companies at various phases of the innovation cycle, over and above access to our facilities, technical expertise and projects.

- **Light touch:** We support any business with light touch advice, sign-posting and networking opportunities.
- **Work plan:** If a business has a clear opportunity for growth and requests support to scale-up, providing it aligns with one of our programmes, we will create a workplan outlining our aims and commitment to work with that business.

Our business support offering:

- **Our Sprint programme** has been extended to offer this valued service to a greater range of organisations. New Sprint packages have been developed that target academia, incubatees/early stage companies and inward investment high growth businesses.
- **Our Rapid Commercialisation programme** uses our geospatial and business strategy expertise and resources to explore the opportunities of space-based datasets to augment existing services offered by medium-large companies.

Our Scale-up programme - our vision is to develop a dedicated Scale-up programme, for all Catapults to opt into.

Over the next few years, we will be working with the community to ensure that the ambition and commercial innovation is present to enable UK success. We will commit to three areas:

- **Communities and Engagement:** Creating advisory boards and communities aligned to key value streams to ensure engagement with the key stakeholders.
- **Partnerships:** Focusing on building major partnerships to develop new market opportunities in space and to support the long-term commercialisation of key projects
- **Commercialisation:** Directing attention to deliver long-term commercial impact from our interventions as projects mature.

For more information Satellite Applications Catapult and how we can work together, please get in touch with the

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