



UK SPACE INNOVATION AND GROWTH STRATEGY:

2015 Update Report

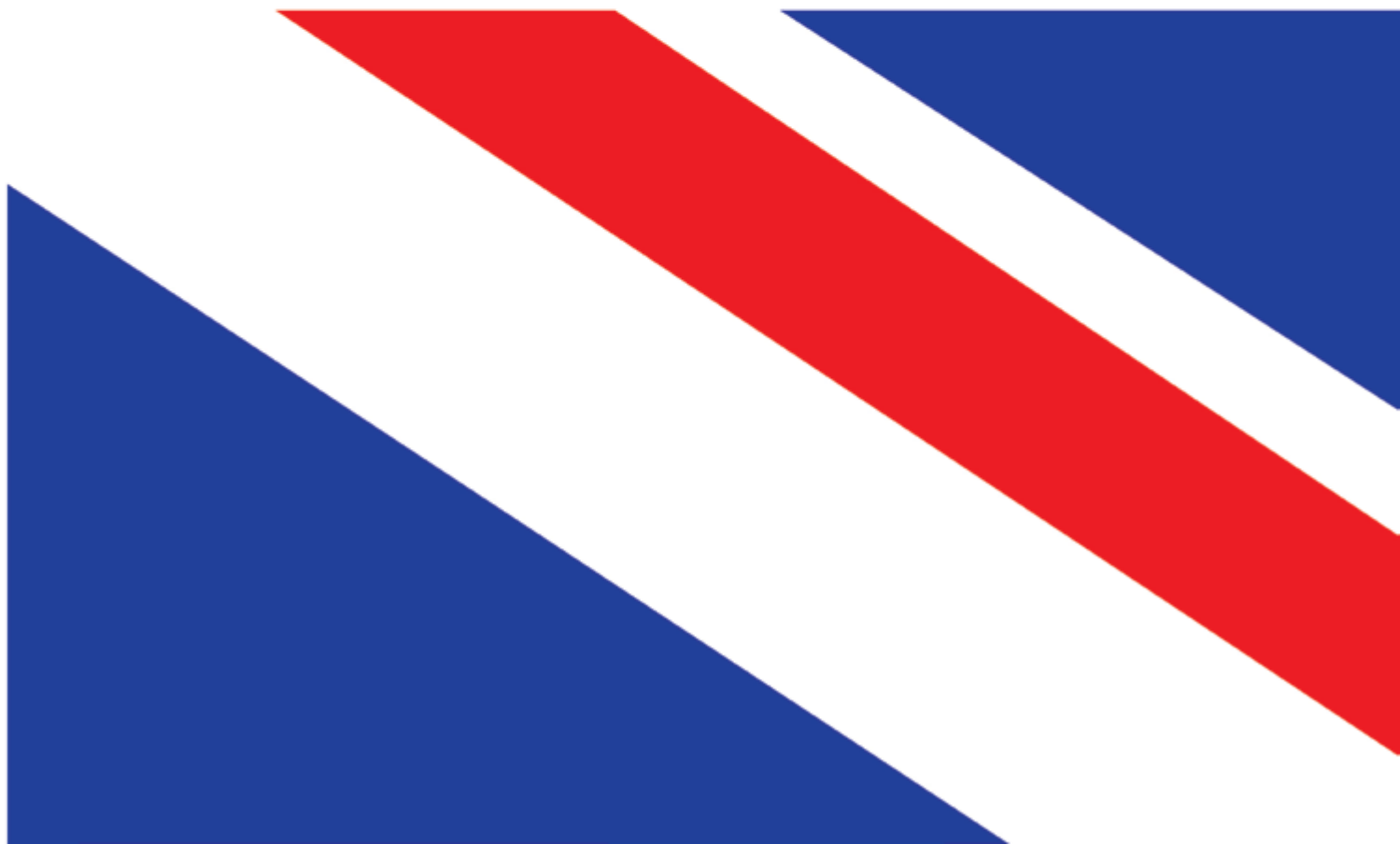


TABLE OF CONTENTS

Foreword	3
Growing Space	4
Embedding Achievements	6
Shaping the Future of the IGS	12
Mapping Actions to Priorities	18

The Space Innovation and Growth Strategy (IGS) brings together a partnership of industry, UK Space Agency, Satellite Applications Catapult, Innovate UK, Knowledge Transfer Network (KTN) and academia. This team is working together to identify opportunities and remove barriers to growth for the UK space sector.

FOREWORD



Andy Green

President of UKspace and Co-chair of the Space Leadership Council

Space is an extraordinary and exciting business. It impacts virtually all aspects of our lives, in an unobtrusive but crucial way. The UK space sector punches above its weight globally and continues to grow much faster than the UK economy. Space is a high growth, high productivity sector where targeted government investment generates further industrial investment and creates highly skilled jobs. It is a key enabler that is critical for our national economy.

It has been my privilege to lead the Space Innovation and Growth Strategy team since 2009. At that time we set an ambitious target - to increase the UK share of the global space economy from 6% to 10% by 2030. In a fiercely competitive international marketplace we knew this would be no easy task. I'm therefore delighted that this progress report shows we are firmly on track. The evidence from the Case for Space 2015 is clear. Industry, government, and academia working together against a clear agenda delivers. This report highlights achievements to date and priorities for the next stage of our journey.



Dr David Parker

CEO, UK Space Agency

The Space Innovation and Growth Strategy (IGS) provides the blueprint and forum to unify industry and Government around a single ambitious growth target: many elements of the Government's National Space Policy, the UK Space Agency's Corporate Plan and the objectives of the Satellite Applications Catapult and Innovate UK can trace a heritage back to the original IGS.

The collective knowledge and expertise of the UK space sector, working as a partnership through the IGS, has the ability and commitment to drive high growth in the UK economy and create jobs around the whole of the UK. This update issued five years after the IGS launch and a quarter of the way to 2030,

Globally, commercial and government interest and investment in space has never been higher. The UK has made smart choices and is well positioned for future success. Global recognition of a resurgent UK space sector is attracting inward investment.

Continuing cooperation between industry, government, and academia can demonstrably create more high quality, high productivity jobs. Companies like Surrey Satellites, Inmarsat and Avanti are driving sustainable export growth. Government departments understand that space delivers secure and efficient outcomes for UK citizens - and supports strong global relationships. During this next phase we will build on this by accelerating projects in diverse sectors such as agriculture, communications and transport, to improve the productivity of the UK economy, and increase exports.

The UK needs the skills to meet this ambitious agenda. Tim Peake's mission to the International Space Station (ISS) later this year will inspire young people, not just to join the space sector, but to study STEM subjects in general. They will then be able to pursue careers in a modern, technically advanced and forward looking economy.

offers a timely reminder of the sector's ambition at the beginning of a new Government. This is a time of sweeping change in the space community, with the rise of 'New Space' or space 2.0. This relates to all areas, operations, platform construction and launchers. The IGS has built sound foundations, but globally, economic times remain challenging and there are many social and environmental stresses on our planet. Space must be relevant to society's needs.

We need to support industry and academia to help drive forward the science and technology and we need partnership with entrepreneurs with new business models that challenge us to think beyond traditional approaches. With a forecast space market worth between £150 billion and £200 billion, there is huge growth potential in this sector for the UK and one where everyone involved needs to work together to unlock it. We relish the challenge.

GROWING SPACE

The Space Innovation and Growth Strategy (IGS) was conceived in 2010 to create a partnership between industry, government and academia to develop, grow and exploit new space related opportunities.

The recently published Case for Space 2015 (C4S 2015) report shows that the UK space industry is already worth £11.8 billion¹ and has been growing by an average of 8.6% year-on-year since 2010. As illustrated in the figure below, the sector has trebled in size since 2000. It now directly employs 37,000 people and is estimated to support over 115,000 jobs in total. Direct employment has grown strongly at an annual rate of 8.4% in the last five years.

The C4S 2015 report has been used as it draws together existing evidence and conducts new analysis to measure robustly the socio-economic contribution of space to the UK economy and society. It looks at the productivity of the space sector and finds that the average UK space economy output per worker is three times higher than the UK average. Space technologies also have a wide range of productivity-enhancing effects on other sectors.

The IGS maintains its target of achieving 10% of the global space market, which is estimated to be £400 billion by 2030.

This report summarises the IGS achievements since 2010 and outlines the plans for the next phase of the programme.

Achievements to date

Over the last five years, the resulting collaboration across the space sector has led to the creation of the UK Space Agency, Space Leadership Council, Satellite Applications Catapult and the development of the UK Space Gateway at Harwell. These developments are all helping to increase the growth of the

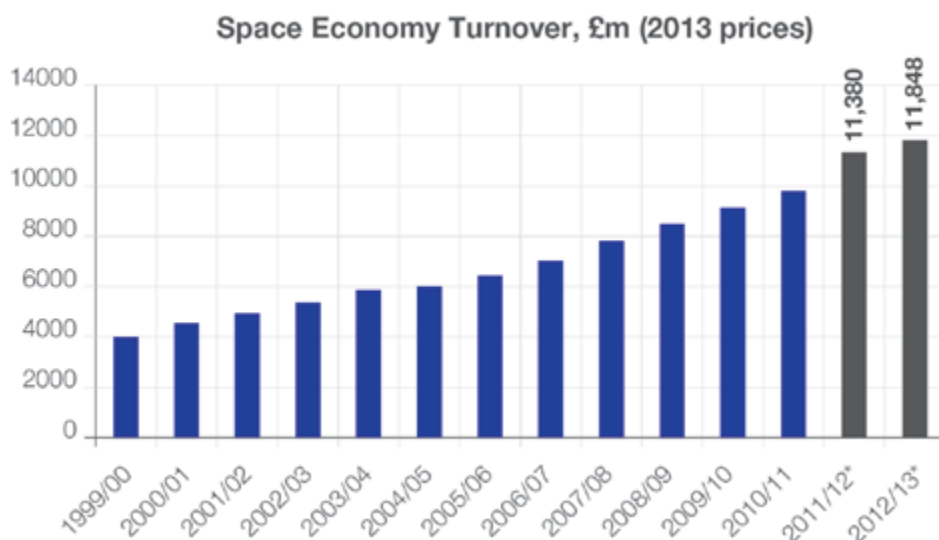
industry and stimulate innovation.

After detailed business cases were assembled by the sector, the government increased its contributions to the European Space Agency (ESA) in two steps from £220 million per annum in 2010 to £300 million in 2015, responding to the IGS call to reach European average level of investments (about £400 million) by 2020. By demonstrating government commitment, this action had global impact, leveraging increased private sector investment and contributing to the decision of twelve companies to expand their UK activities or establish a UK presence for the first time.

Through ESA programmes, the UK is investing in a range of exciting new commercial and scientific missions. These include the development of the new 'Quantum' small and flexible geostationary satellites, as well as the development and testing for the rover for Europe's 2018 ExoMars mission.

By taking the lead in commercial applications using space data, the UK has encouraged the establishment of ESA's new European Centre for Space Applications and Telecommunications (ECSAT) at Harwell which will further benefit the UK and ESA in this high growth area.

Actions resulting from the IGS have improved UK competitiveness, with a number of reforms to licensing, insurance tax and regulation. Within Government, the



Note: 2011/12 and 2012/13 include additional space applications companies. Source: London Economics, C4S 2015

¹ London Economics 'Case for Space 2015'. Methodological improvements may affect comparability of data from 2011 onwards with previous data.

Space for Smarter Government Programme (SSGP) has been set up to improve public services and increase their productivity.

To ensure continued access to space-based services and make the UK more resilient to the risks of operating in space, the UK Space Agency, in cooperation with the Ministry of Defence, Foreign & Commonwealth Office (FCO) and Cabinet Office, is now implementing the National Space Security Policy (NSSP), which was published in 2014.

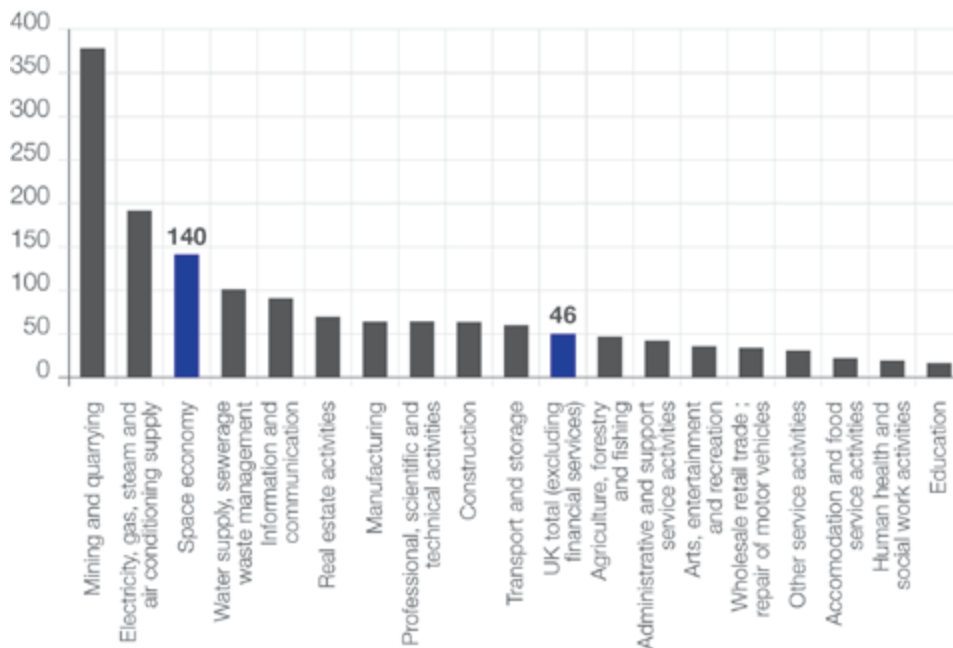
The IGS has identified priority areas to capture new domestic and export markets. The Satellite Applications Catapult is helping to coordinate industry-wide efforts to capitalise on opportunities for maximum benefit to the UK economy.

To reach the growth targets, it is vital to stimulate a vibrant SME environment and grow skills for all space related businesses. The IGS has triggered a number of successful initiatives targeted at businesses both large and small. This has been a mixture of promotion of existing tools and the creation of bespoke solutions for the space sector.

Looking to the future

The target of a £40 billion UK space industry by 2030 will be achieved by identifying and developing

Labour Productivity (£000) per employee

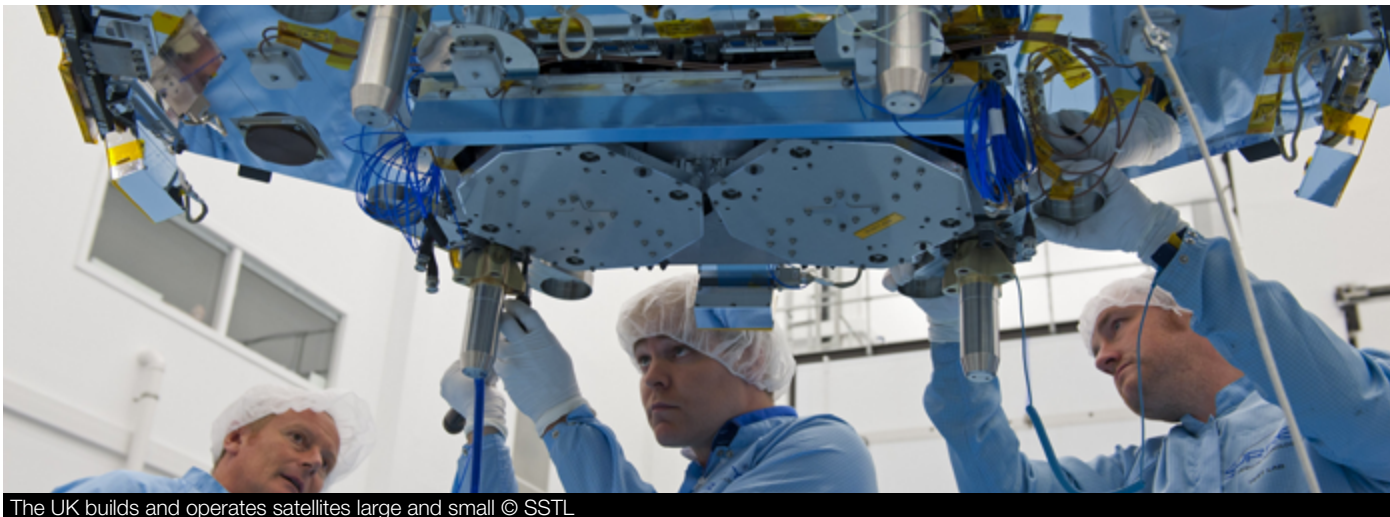


Source: London Economics, C4S 2015

new high-growth markets, pursuing initiatives to substantially grow exports and working to increase the UK's returns from Europe.

The coordinated efforts to date of IGS stakeholders (UKspace, the trade association of the UK space industry, UK Space Agency, Satellite Applications Catapult, Innovate UK, Knowledge Transfer Network and academia) have put the foundations in place.

To reach the target, the rate of progress must now be accelerated. The Space Leadership Council is addressing this by appointing a dedicated IGS Project Director and core team to advance the IGS initiatives.



The UK builds and operates satellites large and small © SSTL

EMBEDDING ACHIEVEMENTS

This space IGS update report brings together stakeholders from all areas of the space sector to refine and reiterate the target of capturing 10% of the global space market by 2030.

New investment opportunities

A key goal of the IGS is to make the UK the best place to start and develop space businesses. To achieve this, the IGS stakeholders have provided business advice and support to companies from start-ups to multi-nationals. For example, the Satellite Applications Catapult has launched a Space Business Portal. The Knowledge Transfer Network (KTN) has established a dedicated space focus to facilitate networking within the sector and across different markets.

Both organisations are helping to speed up innovation within companies and facilitate networking across different markets. Since opening in 2011, the ESA Business Incubation Centre at Harwell has supported forty companies exploiting space technology or applications. The UK Space Agency's National Space Technology Programme (NSTP) has matched private sector investment in space innovation and drawn new companies into the sector. The Innovate UK 'Launchpad' programme has rapidly accelerated the growth of new start-ups and attracted further new private investment.

One of the major hurdles identified for space SMEs has been the supply of finance. New venture capital funds are being set up specifically aimed at supporting space related enterprises. The first, the £80 million Seraphim Space Industry Venture Fund, is due to be launched in the second half of 2015.



Constellations complement traditional space deployment

The Satellite Finance Network (SFN) was established to connect investors and space entrepreneurs and to help navigate the finance and regulatory hurdles:

“SFN events are well regarded and provide vital information, training and networking opportunities for industry and investors at all levels. Foreign companies are now approaching the SFN, looking at the UK as an attractive place to grow and develop their business.”

- Joanne Wheeler, Bird & Bird

Following the last IGS report, the government has worked to develop a regulatory regime that would permit the creation of a commercial spaceport in the UK by 2018. This work will continue with a focus on low cost access to space, building a case for commercial spaceflight and a UK capability to launch small satellites. This has the potential to provide an end-to-end value chain in the UK from satellite manufacturing, through launch to services and applications.

2010



UK SPACE
AGENCY

2011

2013

CATAPULT
Satellite Applications

² Space Innovation and Growth Strategy 2014-2030, Space Growth Action Plan

Identifying opportunities

The IGS Space Growth Action Plan² identified 15 high value markets where the UK can best grow its space business and use space to expand other parts of the economy. The Satellite Applications Catapult and industry has been coordinating stakeholders to consider these market opportunities in more detail. Key opportunities investigated so far include maritime surveillance, the development of new climate applications and the expanding market for low cost access to space.

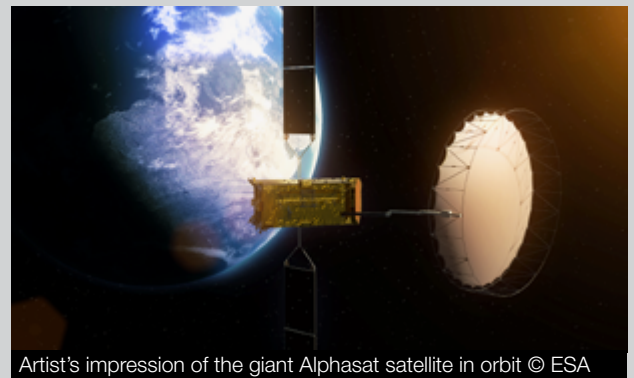
Over the last five years the UK government has championed growth and scientific excellence in space by growing its national investment in space to around £50 million per annum. This provides a foundation for a 'National Space Growth Programme' and investment to date has enabled the UK to accelerate activity in many areas of science and technology, as well as generating the game-changing technologies of the future, such as the SABRE spaceplane engine and the low-cost NovaSAR space-based radar.

The National Space Technology Steering Group (NSTSG) updated and published its strategy in 2014³. This strategy provides a valuable insight into the required technology developments for space infrastructure and applications.

“The technology roadmaps enable choices to be made in future innovation steps to exploit the future opportunities.”

- Patrick Wood, Group Managing Director, Surrey Satellite Technology Ltd and co-chair of the NSTSG

Alphasat enables new services



Artist's impression of the giant Alphasat satellite in orbit © ESA

Alphasat is Europe's largest and most sophisticated telecommunications satellite. Owned and operated by London-based Inmarsat, Alphasat was developed and built with ESA under a public-private partnership.

The satellite – the size of a double decker bus and weighing over six tonnes - was launched into geostationary orbit in July 2013 to provide mobile communications for broadcasters, shipping operators, the military and emergency services as well as oil, mining and aviation industries. By March 2015, Inmarsat had successfully transferred voice and broadband services for Europe, the Middle East and Africa (EMEA) from an earlier generation Inmarsat satellite to Alphasat.

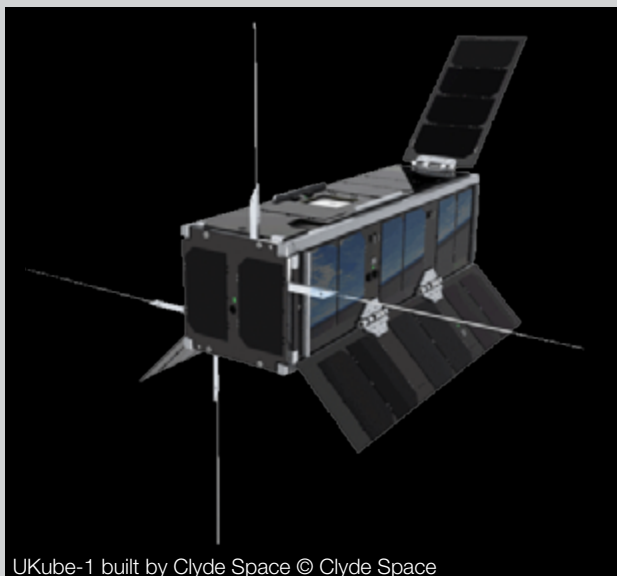
“Already, Inmarsat is working in partnership with leading organisations in eLearning and eHealth to deploy Alphasat's enhanced capabilities to deliver advanced educational and medical services into remote districts in sub-Saharan Africa.”

- Ruy Pinto, Inmarsat's Group Chief Operations Officer



³ National Space Technology Strategy, April 2014, Space Special Interest Group

Kick-starting growth



UKube-1 built by Clyde Space © Clyde Space

Clyde Space already had a global reputation for producing components for CubeSats – miniature (10 cm cubed) satellites – when the UK Space Agency commissioned the Glasgow-based company to build UKube-1.

UKube-1, the UK's first CubeSat and one of the most advanced ever made, was launched in July 2014 into low Earth orbit. It consists of three CubeSats joined together and contains six payloads that brought together UK industry and academia. The benefits for Clyde Space as a business have been invaluable.

“At the end of 2014 we turned over £2 million and we finished at end of this financial year slightly over £3 million. We expect this year to do nearly £6 million.”

- Craig Clark, CEO

Clyde Space has orders for more than 30 small satellites over the next 12-18 months and has set itself an objective: to turn over £20 million in three years.

“We think the market is growing that quickly and if we don't grow we'll be left behind.”

Improving public sector efficiency

Space can help deliver public services more strategically, efficiently and cost-effectively. The Space for Smarter Government Programme (SSGP) has been established by the UK Space Agency, in collaboration with the Satellite Applications Catapult,

to increase the uptake and use of satellite data by public sector users.

The Department for Environment, Food and Rural Affairs (DEFRA) has been working closely with the SSGP team on the potential benefits of satellite data in its priority areas. As a result it has now set the vision: “By 2020 satellite data will play an indispensable role in policy development and operations across the DEFRA network.”

SSGP has launched two funding calls, leading to the delivery of 14 innovative projects by the end of March 2015. These projects demonstrated the potential that space has to deliver government business more efficiently. For example, one project enabled a Harwell based SME, Sterling Geo, to demonstrate the potential of its satellite services to 100 public sector users for a trial period.

Reforming regulation

The UK is innovative and entrepreneurial. Over the past five years, the UK has once again become one of the world's leading space nations. This has attracted more companies to set up or increase operations in the UK, driven by the coordinated efforts of the UK Space Agency and UK Trade and Investment (UKTI).

“In recent years the UK has demonstrated a clear commitment to grow its commercial space sector - this has been a significant factor in our decision to expand our UK operation as a basis for our planned European growth.”

- Joanna Boshouwers, General Manager, MDA Corporation

The Outer Space Act 1986 was an area identified jointly by government and industry for reform as the unlimited liability it placed on operators hindered the industry's ability to access new markets. The Act regulates UK space activity to ensure it complies with international obligations and allows for licensing the launch and operation of satellites and other spacecraft. Following a consultation process, the Agency has intervened to cap space operators' liability at €60 million, for the majority of missions.

The government has also implemented a waiver for UK spacecraft operators of the 6% insurance

premium tax. This will not only reduce the cost of insuring spacecraft, but also further improve the competitiveness of the UK's space insurance industry.

Increasing importance of Europe

The European Engagement Plan is the culmination of work by a team of experts from IGS stakeholders to set the direction and pace for the UK to increase its opportunities in Europe. This plan, aimed mainly at the interaction with the EU and its institutions, outlines a set of measures for IGS stakeholders to act together to increase the UK's influence in and return from European programmes.

Through the IGS and Space Leadership Council, the UK has put together a more coherent and compelling case for increased investment in ESA. A detailed 2014 review of studies on the socio-economic impacts from space activities in Europe, in which ESA programmes play a key role, highlights the numerous and widespread positive returns from space activities⁴.

“Despite being in a period of economic uncertainty, the UK significantly increased its ESA contributions in both the 2012 and 2014 Council of Ministers meetings based on its vision for growth in the space sector. This has provided significant benefit to the UK, giving us a much stronger voice within ESA, where we are a major player – particularly in Telecommunications, Navigation and Earth Observation.”

- Colin Paynter, MD Airbus Defence and Space UK

Through its increased contributions to ESA in 2014, the UK has strengthened its role in three major international space programmes as well as other long-term projects. These include the ‘Quantum’ telecommunications satellite, an increase in the size of the Integrated Applications Programme (IAP) and the ExoMars Rover, securing the UK lead for the manufacture of the rover.

International partnerships



Pupils at a Tanzania school enjoying internet access powered by Ka-band satellite © Avanti Communications

The British broadband satellite operator Avanti Communications is expanding within Africa with two new contracts as part of the UK Space Agency's International Partnership Space Programme. One will deliver an aviation project across multiple countries in the continent and the other will provide crucial ICT infrastructure in Tanzania. This infrastructure will enable digital training and e-learning for teachers in up to 250 rural schools in Tanzania.

Aviation safety is an important issue in Africa as, despite having only 3% of global air traffic, it accounts for around 20% of air accidents worldwide. Avanti is leading the Satellite Based Augmentation System for Africa (SBAS-AFRICA) to demonstrate potential improvements in flight safety.

“SBAS-AFRICA established crucial collaboration between the UK and a number of African countries.”

- Matthew O'Connor,
Chief Operating Officer at Avanti Communications

⁴ Evaluation of Socio-economic impacts from Space Activities in the EU, Booz & Company, 2014

Harwell fosters fast growing companies



Harwell Campus © STFC

Since its formation in 2012, Rezatec, a remote sensing company that provides monitoring and detection of environmental change, has gone from strength to strength. It has helped businesses make use of the increasingly sophisticated but complex array of Earth observation imagery and data.

Confidence in the potential of the company is demonstrated by its equity finance raising in excess of £1 million. It has more than doubled the number of its Harwell based employees to 12, as it continues to win new commercial contracts and grant financing for innovative products that will further increase its future capability. Customers to date include British Sugar, Ecover, Drax and Scottish Water.

“We expect our revenues to be well in excess of £1 million this year for the first time as we look to consolidate our position in a competitive environment by continuing to produce new and innovative products.”

- Patrick Newton, CEO

“Being based in the Satellite Applications Catapult building at Harwell Campus has been a huge benefit because of the networking potential it has afforded a small company like ours, so much so that we have become a fairly well-known brand in a short period of time.”

- Tim Vallings, Commercial Director

Growing export opportunities

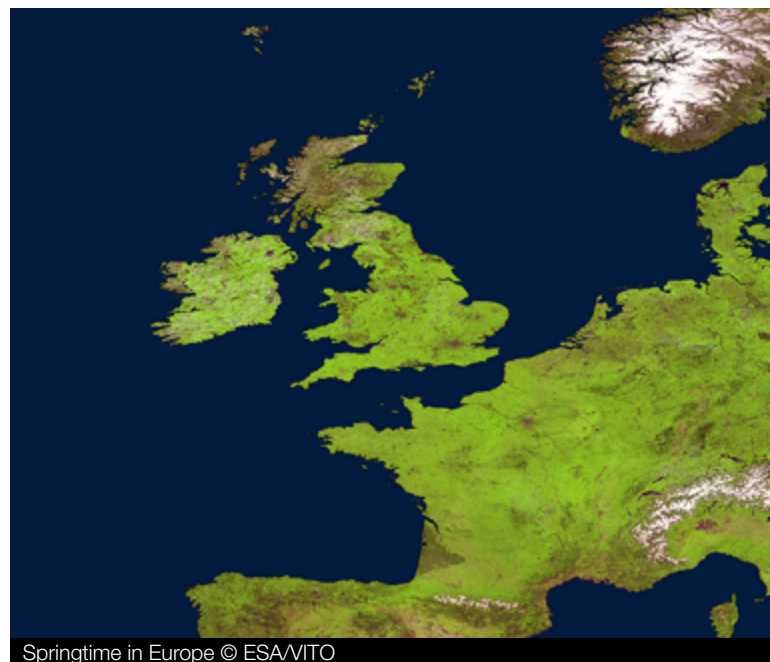
To reach the target of 10% of the global space market by 2030, the UK will have to significantly increase its exports. To aid this, IGS stakeholders have improved the coordination of export activities and set up a Strategic Export Group to address the challenges that companies are facing.

The increased inward investment the UK has seen in the past five years has significantly strengthened the range of products and services offered by UK industry, and several are now exporting from the UK to global markets.

The establishment of bi-lateral collaborations with other nations was identified in the IGS Space Growth Action Plan as a route to increasing export opportunities. The £32 million International Partnership Space Programme (IPSP) has been established by the UK Space Agency, resulting in 18 projects, which will see UK companies working with international partners to develop satellite applications and infrastructure in emerging economies. These projects will open new international markets for UK companies by demonstrating the societal and economic benefits that they can provide.

Improving skills

The Case for Space 2015 report highlighted that employment in the space industry has been increasing by an average of 7.4% year on year since 2000, and accelerating over the last five years. This



Springtime in Europe © ESAVITO

highlights the need in the UK for a significant increase in the number of skilled engineers and entrepreneurial business leaders. It is worth noting that many of the students that will fill the 100,000 jobs the IGS aims to create by 2030 are just starting secondary school.

A number of new training opportunities have already been put in place to increase the relevant skills for the space industry. The first cohort of Higher Apprentices and Space Studio School students are just completing their first year of studies and apprenticeships. They are supported through a long-term apprenticeship collaboration with Airbus at Portsmouth's Highbury College.

The Space Internship Network (SpIN) is now in its third year, raising awareness among students of the opportunities available in the space industry and proving a useful recruiting opportunity for companies.

Innovate UK's KTP (Knowledge Transfer Programme) call, dedicated to space, is utilising an established and well proven tool in the space sector. This £1 million investment enables knowledge transfer out of the research base through graduate placements into businesses. It includes giving graduates business training and a chance to go to the International Space University.

At the end of 2015, British ESA astronaut Tim Peake will begin his six-month mission to the International Space Station. This will further inspire an interest in STEM subjects in schools and enthuse the public about the wider benefits of space.



Mission to Mars



A prototype rover in the Stevenage Mars Yard
© Airbus Defence and Space

When the ExoMars mission lands on the surface of Mars in 2019, the first European Mars rover will have been developed, built and tested in the UK.

Airbus Defence and Space in Stevenage is leading the rover's construction with a new bio-clean room and a bigger revamped Mars Yard, which opened in 2014, to test the rover on simulated Martian terrain.

In the last two years the Mars rover team has increased from 30 to 140 people.

“Most of those are high grade professional engineers - a mix of UK and European nationals. It's a good learning ground for our people. Space projects are demanding but this is something that's going to have to exist on the surface of Mars, have autonomy and be flexible to adapt to the mission.”

- Andy Stroomer, Airbus UK Director of Earth Observation, Navigation and Science

SHAPING THE FUTURE OF THE IGS

As this report illustrates, the Space Innovation and Growth Strategy (IGS) has been a driving force for creating UK economic growth. This energy and focus needs to be maintained to capture 10% of the global space market by 2030.

Delivering the IGS

The actions identified in the IGS Space Growth Action Plan (2013) have been taken forward by IGS stakeholders, with the IGS Implementation Team coordinating and monitoring progress. This team provides regular reporting and updates on key topics to the Space Leadership Council (SLC).

The SLC, comprised of senior representatives from all the IGS stakeholders and the government minister, provides oversight and governance. Recently, following a recommendation from the IGS Implementation Team, it has committed to increase the level of resources through the addition of an IGS core team. This is particularly important as many of the issues now being addressed are complex and require dedicated support to progress.

A full-time IGS Project Director is being appointed and the core team of full-time equivalents will be drawn from across the IGS stakeholders. This additional support will not only accelerate progress but also allow the IGS to better communicate activities and progress to the wider community. This team will report directly to the SLC, but with the option of drawing on *ad hoc* support from the IGS stakeholder leaders as and when required.

The IGS goals are challenging but achievable if all the stakeholders work together to open up and exploit new market opportunities. The greater the involvement from UK companies to support these activities, the more likely it is that this will be achieved.

Prioritising future activities

This update report builds on the foundations of the IGS Space Growth Action Plan, further clarifying its five recommendations into more succinct 'Themes'. These themes, supported by ten associated priorities, are outlined in the following pages. It should be noted that the actions from the 2013 report have been mapped into these new IGS priorities (see page 18). Over the next two years the pace of market opportunity investigations will increase. These will produce roadmaps that will give actions to all stakeholders.



I - DEVELOP PRIORITY SPACE ENABLED MARKETS

1. Address high value market opportunities for UK businesses by developing and implementing growth roadmaps

As part of the process, coordinated by the Satellite Applications Catapult but involving all IGS stakeholders, opportunities will be reviewed regularly to ensure that target areas identified are revalidated or new ones prioritised.

It is essential that stakeholders work together within the IGS framework to build and implement these roadmaps. This will be a challenge, but as the space industry starts to capitalise on the opportunities that these roadmaps identify, the involvement from the sector is expected to broaden.

2. Increase the use of space applications and infrastructure to meet the UK's security and defence needs

As dependence on space services increases, it is imperative that space applications and infrastructure are resilient. Through the IGS, the UK Space Agency will draw on expertise across the sector to implement the priorities set out in the National Space Security Policy (NSSP)⁵: increasing the resilience of space services, ensuring the sustainability of space as an operating environment and maximising industrial and academic benefit from expertise in the field.

Recognising the strategic value that space represents to civil, security and defence interests, industry will continue to explore and develop resilient communications and navigation technologies. This will involve working with domestic and international partners to build the UK's ability to forecast and respond effectively to space weather events and to develop a better understanding of the immediate space environment.

3. Further develop analysis of the economic impact of the space sector

Additional analysis of the space sector is required to generate further evidence and deepen our understanding of its economic impact. This, taken together with the current evidence base on the benefits of space, such as the 'Size and Health of the UK Space Industry' and collaborative 'Case for Space'

research projects should strengthen the case for increased investment in the sector. Industry, working closely with the UK Space Agency, will ensure that proper evaluation is built into new projects and programmes to provide robust evidence on the economic impact of future activities.

⁵ HM Government: National Space Security Policy (April 2014)

II - ENSURE THE UK REGULATORY ENVIRONMENT SUPPORTS BUSINESS GROWTH

4. Promote relevant regulatory and spectrum regimes to maximise UK business growth

IGS stakeholders will fully support the newly established regulatory and spectrum working groups to ensure that they identify and tackle current and future key issues related to spectrum, licensing, regulation and security to maximise UK business growth.

In May 2015, the UK Space Agency signed a Memorandum of Understanding with the UK spectrum regulator, Ofcom, forming a CEO-level liaison group to develop a close and transparent relationship. This has led to the formation of a space spectrum advisory committee of senior industry stakeholders jointly chaired by Ofcom and the Agency. This

committee will assist in reaching consensus on difficult spectrum choices and improve communication between IGS stakeholders and Ofcom with regards to the UK space sector's spectrum needs.

In addition, IGS stakeholders will continue working to shape European regulation of the use and manufacture of classified technologies that employ the Galileo Public Regulated Service. A key priority will be to safeguard these technologies whilst equipping industry and future users with the greatest possible freedom to operate and utilise them.

III - INCREASE THE UK'S RETURNS FROM EUROPE

5. Implement the European Space Engagement Plan

The new European Engagement Plan aims to ensure that the UK gains maximum benefit from Europe's investments in space and from working alongside a wider range of European institutional partners. IGS stakeholders will influence policy and the regulatory landscape by strengthening UK involvement in advisory and consultative processes. The outcome should be greater returns to the UK from across Horizon 2020 (and beyond) and procurement contracts for the operation of Europe's satellite networks and the accompanying applications infrastructure.

Key actions will be to gather and join up intelligence on developments in the rest of Europe, creating a more cohesive intelligence base for stakeholder action, and to map such developments onto the market opportunity roadmaps. This will ensure that opportunities are not missed and that potential policy and regulatory barriers are identified and addressed.

IV - GROW EXPORTS BY ENHANCING UK COMPETITIVENESS

6. Drive UK exports

By the end of 2017, IGS stakeholders will have put in place a package of measures aimed at increasing UK space-related exports from £3.6 billion today (31% of turnover), according to C4S 2015, to £25 billion by 2030 (over 60% of turnover). This ambitious target requires that opportunities for exporting applications and services are fully exploited.

The recently established Strategic Export Group will identify the barriers to export and drive the implementation of measures to

overcome them. The stakeholders in this group include the Satellite Finance Network, UKspace, UK Export Finance, UK Space Agency, Innovate UK and UK Trade and Investment.

This package of measures is likely to include a concerted campaign by the space industry and government to encourage and coach businesses to take their products quickly to export.

7. Access High Value Market Opportunities through an increased investment in the National Space Growth Programme

IGS stakeholders will work together to build a comprehensive and compelling case for increased national investment to complement and leverage the investment in ESA. Any increase in the UK's National Space Growth Programme will have to demonstrate an exceptional return by targeting investments at the projects that will generate the highest economic, social and productivity benefit for the UK.

If the UK is to achieve its growth target, it must be able to respond rapidly to opportunities and

market demand. Where there is a significant risk, it may be appropriate for the Government to help secure funding. This could include the creation of new investment models, for example, repayable investments.

A potential candidate is the recent revolution in 'big space data' - analysing the huge data sets being produced by Earth observation satellites, as well as increasing the use of space to deliver ubiquitous communications and connectivity.

V - STIMULATE A VIBRANT SPACE LANDSCAPE ACROSS THE UK TO GROW SPACE BUSINESSES

8. Encourage space-related businesses, especially SMEs, to maximise opportunities for growth

SMEs are the life blood of the economy and vital for stimulating growth. Not only do SMEs contribute to economic benefit directly by virtue of their capacity to innovate, they also stimulate change among larger incumbents.

IGS stakeholders will build on existing measures to ensure SMEs and other businesses are able to maximise growth opportunities. This will increasingly involve helping businesses to scale-up operations to move them into the medium and large business categories.

As with all businesses, SMEs require a supportive business environment to help establish networks, understand and access finance, improve the skills of their managers and workers and to develop international export opportunities. The Satellite Applications Catapult offers a package of measures to help businesses of all sizes. The KTN, with its large and diverse SME community, will continue to identify further initiatives to ensure that companies can take maximum advantage of the UK's competitive environment.

9. Grow regional space clusters, including Harwell

Working on behalf of the sector, the UK Space Agency and Satellite Applications Catapult will broaden and deepen interactions with the Local Enterprise Partnerships and Devolved Administrations to increase their recognition of and support for space. This work will identify specific opportunities to build and better utilise local capacity and link this to national capabilities and facilities, including the key assets at Harwell - where there are about 60 space companies (May 2015).

Further activities will expand focus, so that regions yet to recognise space explicitly as a

growth area begin to do so. This will ensure that these regions appreciate that a number of their existing sectors could benefit from the space enabled markets identified in the Space Growth Action Plan. The UK Space Agency will also work closely with colleagues across Government to maximise the opportunities that may be offered through the localism and devolution agendas.

An example of regional growth is the development of the UK's 'big data' capability, where there is a growing capability developing in the north-west of England.

10. Ensure skills are in place for the UK to develop space related opportunities

Sustainable growth in the space industry will only be achieved by ensuring that there is a ready supply of appropriately skilled graduates and apprentices and that they are attracted to the space industry. Employees in the space sector are on average some of the most qualified in the UK, with 75% holding a first degree or HND/HNC.

IGS stakeholders will work with the Research Councils to influence the skills provision and development of doctoral students and researchers and to collaborate and exchange

knowledge for the longer term. The review of skills needs will be followed up with improved continuing professional development opportunities for employees and researchers.

Tim Peake's mission to the International Space Station will be widely marketed to encourage students into STEM subjects. The provision of quality work experience opportunities with IGS stakeholders will provide the right supportive environment for growth by attracting significant numbers of new skilled entrants to the space sector.



British ESA astronaut Tim Peake training for his 2015 mission © ESA

MAPPING IGS GAP ACTIONS TO PRIORITIES

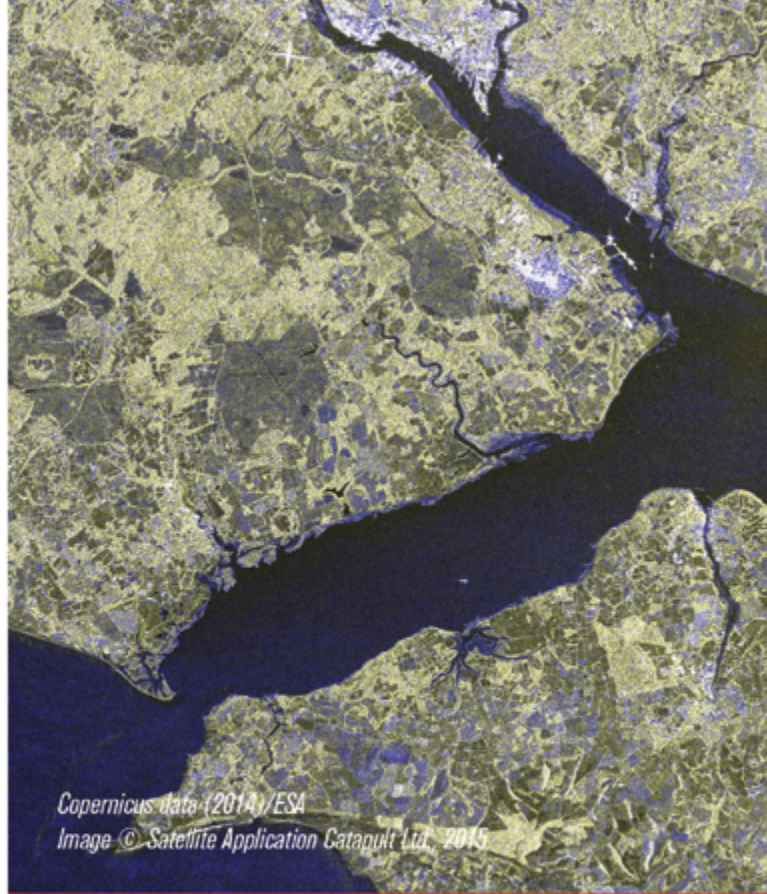
The following table illustrates how action from the IGS 2013 Growth Action Plan (GAP) have been mapped into new priorities.

Priority	Corresponding GAP Actions
1. Address high value market opportunities for UK businesses by developing and implementing growth roadmaps	<ul style="list-style-type: none"> • 1.2 (Develop priority market roadmaps) • 1.3 (Review roadmaps annually) • 1.5 (Establish climate services centre in UK) • 1.6 (Invest in new EO services) • 2.6 (Establish a UK space port) • 5.6 (Coordinate ground segment infrastructure)
2. Increase the use of space applications and infrastructure to meet the UK's security and defence needs	NEW
3. Further develop analysis of the economic impact of the space sector	<ul style="list-style-type: none"> • 4.3 (Produce economic analysis of sector)
4. Promote relevant regulatory and spectrum regimes to maximise UK business growth	<ul style="list-style-type: none"> • 2.1 (Benchmark UK competitiveness) • 2.2 (Establish space regulatory & spectrum group) • 2.5 (Simplify licensing criteria for SMEs & start-ups)
5. Implement the European Space Engagement Plan	<ul style="list-style-type: none"> • 3.1 (Develop European Space Engagement plan) • 3.3 (Promote wider use of ESA PPPs)
6. Drive UK exports	<ul style="list-style-type: none"> • 4.7 (Establish strategic export group) • 4.9 (Run SME 'are you export ready' workshops) • 4.10 (Run missions to secure new partnerships)
7. Access High Value Market Opportunities through an increased investment in the National Space Growth Programme	<ul style="list-style-type: none"> • 1.7 (Grow SSGP) • 4.1 (Establish National Space Growth Programme) • 4.2 (Develop repayable investment funding mechanism to fund innovative infrastructure) • 4.4 (Launch 3 bilateral science projects) • 4.5 (Align R&D calls with market/technology roadmaps) • 4.6 (Increase investment into game changing technologies) • 4.8 (Promote use of space for overseas aid)
8. Encourage space-related businesses, especially SMEs to maximise opportunities for growth	<ul style="list-style-type: none"> • 4.9 (Run 'are you export ready' workshops for SMEs) • 5.1 (Increase SMEs in supply chain) • 5.2 (Create a single SME information access point)
9. Grow regional space clusters, including Harwell	<ul style="list-style-type: none"> • 5.4 (Use Harwell Space Gateway to promote investment in local space clusters) • 4.11 (Encourage inward investment) • 5.5 (Develop regional growth plans for space)
10. Ensure skills are in place for the UK to develop space related opportunities	<ul style="list-style-type: none"> • 5.8 (Support space doctoral training centres) • 5.9 (National schools challenge for Tim Peake mission)

Actions not mapped into new Priorities

- Action 1.1 (Integrated marketing campaign): Core activity for Catapult
- Action 1.4 (Launch cross sector R&D calls): Core Innovate UK activity
- Action 2.3 (Prioritise UK operators in international spectrum negotiations) / Action 2.4 (Revise OSA license processes to require applicants to meet targets): Under review but currently not possible to implement
- Actions 3.2 (Second industry experts in EU orgs) / 3.4 (Secure British Operational Director at ESA): superseded by European Engagement plan
- Action 5.3 (Move Space SIG to full KTN): Completed
- Action 5.7 (Establish national space skills 'point of contact'): Completed





*Copernicus data (2014)/ESA
Image © Satellite Application Catapult Ltd. 2015*

