



2030

A World Empowered by Space

Era of Personalised Space

The

UK is writing a new, dynamic chapter in the history of space. From the pioneering days of space exploration to the dawning of commercial exploitation, we are now entering a third era – personalised space.

The cost of accessing space is coming down, small satellites are cheaper yet more capable and the opportunities for space-based solutions continue to increase. New applications enabled by satellites are changing the way we communicate, farm, travel, manage resources, protect environments, search online and even stay healthy.

With space data increasingly available, a host of young, creative companies is defining a New Space Age and changing the way we see the world.

The UK's leadership in space technology and applications has been a significant source of economic and political strength, despite the tough financial climate. Britain's commercial goal is to retain that leadership and grow our global market share from 6.5% to 10% of an anticipated £400 billion by 2030.

Our space sector is more than capable of achieving this target and will keep us at the forefront of this fast evolving market.

Our satellite capabilities help us to monitor and manage major societal challenges such as climate change, resource scarcity, healthcare and ageing population. Space technology remains a powerful engine of development and empowerment, one that has forever changed our expectations of connectivity, mapping and insight.

Over the next decade, our relationship with space will change dramatically. It will increasingly become 'ours' and not just the preserve of nation states. Tourists will go into orbit, taken there by private companies; new launch vehicles will take off, different in design but sharing the goal of slashing the cost of getting into space. Data will rain down from satellites of all sizes, some owned by companies, others by schools; many networked together to create an 'internet of the sky'. New businesses – and entire industries – will spring up in response and we will access this new space age in our homes and our cars, and even through the clothes we wear.



If this seems unlikely, simply consider the transformative effect of smartphone technology. The original iPhone was launched in 2007; imagine where we will be in 16 years' time...

This document sets out our vision for the space-enabled world of 2030 and shows how satellite-based services will become increasingly essential in our day-to-day lives.

Space in 2030: Open for Business

By

2030, the commercial space sector is transformed.

The old uncertainties and long lead times are now historical footnotes as cutting-edge, UK-based businesses design, manufacture and provide the infrastructure for more democratic access to space.

Launching payloads into orbit has become vastly more affordable: more commercial operators have entered the market, taking advantage of new materials and technologies, while reusable space planes have slashed launch costs by up to 80% compared to 2014. A flexible, business-friendly regulatory environment has enabled a number of commercial launch systems which has led to lower insurance costs.

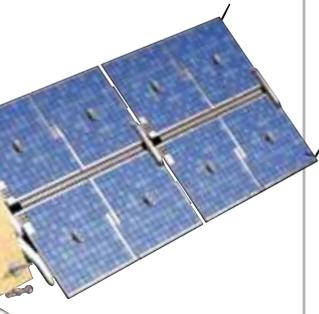
The UK has honed its competitive edge in small satellites and high-efficiency space operations and is the partner of choice for other countries seeking affordable access to space. Networks of commercially operated small satellites offer cheaper, quicker, more resilient and more scalable solutions and this is creating a wealth of new markets.

Satellite technology and data have spawned entire new industries and triggered growth across many downstream services and applications. Manufacturing of advanced materials and biomedical products in the microgravity conditions of space is routine. British operators can now supply geo-information from space in seconds, rather than days. Data relay satellites and optical

communication links between satellites permit persistent, real-time global monitoring from space with high-resolution sensors, benefitting finance, construction, transport, manufacturing and many other high-value sectors.

The majority of space technology research and development is now funded by very competitive commercial enterprises. While government is the largest commercial customer for space-derived data, it focuses its investment efforts on stimulating game-changing, next-generation concepts in science and engineering.

The contribution of space and space-enabled services to the UK GDP continues to grow at a significantly higher rate than the economy as a whole, creating attractive new jobs and business opportunities.





Smart Cities



In 2030, Galileo and GPS services are embedded in all manner of intelligent devices. Everything and everyone has awareness of their precise location at all times, whether they are in a city-centre building or the middle of an ocean. Innovative UK firms, outside the traditional space sector, generate smart solutions and are seeing the potential for rapid growth of geo-location data.

Geodata has become a familiar, ever-present tool of connected, informed societies. Maps, imagery and applications built on information from satellites, together with data from ground and airborne sources, are available to anyone, anywhere, 24 hours a day. Geodata is routinely used in our everyday lives, from house-hunting to virtual travel, and is a vital tool for public administration.

Communities worldwide are using satellite-enabled services to improve their quality of governance. As growing and increasingly mobile populations have propelled a vast and rapid migration to cities, our enhanced ability to map and monitor these changes from space facilitates the development of megacities and the provision of vital support services such as water, fuel and sanitation.

Intelligent Transport

The

UK's long-term focus on satellite applications has given us a head start in creating intelligent transport infrastructures and selling them to the world. Road traffic automation enabled by satellite navigation and integrated communication networks prevents accidents, reduces congestion, saves energy and gives us back our time. Motorways have driverless car lanes where vehicle movements are effortlessly synchronised from space, and our automotive industry leads the world in the manufacture of integrated autonomous navigation systems.

New high-speed rail networks are built without the need for ground-based signalling. Britain now has the busiest and most efficient rail network in the world, with satellites helping operators to run more trains, more efficiently and safely, on the network.

Space technology has delivered increased airspace capacity and lower airline operating costs, with aircraft using hyper-accurate navigation and weather data to plot optimal routes and airports better able to schedule arrivals and turn-arounds. The sector's safety record, already good, has improved even further and now has an environmental record to match.

Secure satellite signals have also made possible the safe operation of civilian unmanned aerial vehicles (UAV)

in non-segregated airspace. Flying to the same rules as manned aircraft, UAVs now routinely deliver goods, monitor crops, energy and transport infrastructure, and fly hazardous long-duration search and rescue missions.

The world's trade still travels by sea but orbital positioning and weather data has made shipping safer, greener and far more efficient. Competitive commercial meteorology providers use advanced sensors in space to deliver accurate short- and long-term forecasts for route mapping, and cargo being transported to port by land now arrives at precisely the right time for loading on board the designated ship. Satellite-enabled security networks have also helped relegate piracy to the history books.





Climate and Resources



Space

has transformed the way we view the Earth and use its resources.

Millions of low-cost sensors on land and at sea are connected via satellite to continuous Earth monitoring networks, which in turn provide greatly enhanced levels of global insight that power scientific discovery and new business models.

The economic development of the Arctic region has been facilitated by space-based communications, navigation and geo-information technology. The polar telecommunications gap has been filled by small satellite networks optimised for the purpose, with UK space industry and service providers leading the way. Space assets keep ships, subs, rigs, tankers and personnel safe in the planet's harshest working environment, while also ensuring rigorous international standards of environmental protection are upheld.

The UK's long-term strength in Earth observation and climate change research

has created major business opportunities in the new science-enabled sectors of global resource management and carbon trading.

As nations unite to harvest power from the Sun via the new Solar Orbital Power Station, space security has become a field of institutionalised international cooperation. Monitoring and controlling Earth orbits has become as important as air traffic control, and UK industry and insurance firms are key players in the removal of space debris, which is a brand new market.

The latest Earth observation craft, networked with highly precise navigation satellites and ground-based sensors, now give us the first accurate early warning of impending geo-hazards such as volcanic eruptions, earthquakes and tsunamis. Global cooperation and space-powered, real-time situational awareness also support quicker and more effective responses, reducing the human, economic and environmental cost of natural disasters.

Agriculture, Food and Fisheries

Satellites

provide us with the means to monitor change across the globe, in real time and over extended periods. In 2030, the modelling of the Earth's physical processes is enhanced by the wealth of data from space-enabled sensor networks and British companies are at the forefront of turning this information into valuable commercial products.

Orbital monitoring and environmental data are helping us preserve biodiversity, protect the environment and enforce international agreements from deforestation to illegal fishing. The UK's lead in smart, space-based radar for maritime surveillance has seen endangered fish stocks restored, illegal fishing combated and global ocean reserves protected for future generations.

With the world's population standing at more than 8.3 billion, 2030 sees an increasing demand for food matched by escalating water shortages in large parts of the globe. Mapping and remote sensing from space help communities conserve and find new sources of water.

Space is also powering precision farming techniques, including crop growth monitoring and disease prediction. As a result, yields have improved, the use of fuel and fertilisers has reduced and crop shortfalls are more manageable thanks to early warnings. Satellite mapping also helps bring degraded and post-industrial sites back into use, opening up new land for agricultural use and restoring damaged environments.

All these factors combine to help defuse the worse impacts of climate change, reducing the flashpoints for conflict and mass displacement.





Health and Wellbeing



In

2030, telemedicine is improving our wellbeing and mobility, while saving the Health

Service many millions of pounds each year. Patients with chronic long-term conditions, the elderly wanting to maintain independence and the general public seeking to stay healthy all benefit from sensors in their homes, clothes and communications devices which relay physiological data to medical professionals and carers via satellite.

Ubiquitous high-speed broadband has made flexible working the accepted norm and broadband from space is transforming connectivity and trade in distant rural locations and developing nations.

Africa and other emerging economies have seized on the communications and remote sensing capabilities of satellites, largely bypassing costly and vulnerable ground-based infrastructure. Telemedicine has increased life expectancy while remote education has greatly improved employment prospects and helped young women, in particular, break the cycle of poor schooling and life options that were



previously limited to marriage in childhood, having children and subsistence farming. Thanks to new constellations of satellites which provide easy access to information, electronic banking and trading partners, even remote communities are now trading hubs, with women often leading the way in business.

While astronauts continue to push the boundaries of human space travel in 2030, thousands of passengers from the UK enjoy the opportunity to travel to the edge of space. We see the beginning of a new age of intercontinental travel – this time through space – at increasingly affordable prices. Accurate daily weather forecasts have boosted the hugely valuable events and tourism sectors, with localised microclimate information giving people the confidence to go out, join in and explore.

A Connected Life

Connectivity

is now taken for granted by everyone. Thanks to a new generation of digital communication satellites designed and built in the UK, everyone enjoys access to reliable, affordable, ultrafast broadband, with all the benefits and entertainment this brings, from seamless sharing of data to 32K TV on demand to virtual reality gaming.

This superfast connection supports the 'Internet of Things', providing uninterrupted broadband service where terrestrial networks fail or simply don't exist, including in remote rural locations, at sea and in the air.



Satellites are still the backbone that enables and connects terrestrial mobile networks, providing the resilience, security and flexibility needed by a modern society.

Due to its success, we take it for granted that we can have real-time access to geo-information...and that smart refrigerators and kitchens will re-order food staples. It is unremarkable that the heating goes on just before we get home and the car defrosts itself automatically ahead of the morning commute. This is no longer the unproductive grind it was in 2014, with new cars able to self-drive and form fuel-saving, satellite co-ordinated 'car trains' on longer motorway journeys. Once at their destination, they self-park while we get on with our activities.

Life in 2030 is not only more convenient, it is more productive, with space-based technologies helping us reclaim lost time and live well while consuming fewer resources.





Excellence 3.0



By the third decade of the 21st Century, the UK has established a commanding position in space. We take a leading role in international collaborations, providing the technologies and services that enable exploration of our Sun and the solar system. These high profile endeavours are used by schools to inspire a new generation of scientists and engineers.

Britain's flexible and efficient partnership structures for space sector management have been adopted by other countries, working closely with the UK's national space agency. The entrepreneurial, application orientated approach to space is now a guiding principle for the member states of the European Space Agency. The market for space-enabled products and services is open for business. Cross-sector innovation, access to private finance and insurance, and speed to market are particular UK strengths that keep us in the lead.

As a result, Britain is host to a dynamic ecosystem of small, medium and large firms that turn space-enabled opportunities into profitable business and jobs. Because we recognised the value of satellite applications before others did, the UK in 2030 is the world's largest exporter of space-related services.



This document has been produced by the Satellite Applications Catapult, on behalf of the UK space sector.

CATAPULT Satellite Applications

The Satellite Applications Catapult is an independent innovation and technology company, created to foster growth across the economy through the exploitation of space. It helps organisations make use of and benefit from satellite technologies, and brings together multi-disciplinary teams to generate ideas and solutions in an open innovation environment. The Satellite Applications Catapult is one of a network of centres established by Innovate UK to accelerate the take-up of emerging technologies and drive economic growth. A not for profit company, it provides facilities, platforms and expert knowledge to enable the translation of ideas from concept to market.

Other contributing organisations include:



The European Space Agency (ESA) is Europe's gateway to space. It is an intergovernmental organisation, created in 1975, with the mission to shape the development of Europe's space capability and ensure that investment in space delivers benefits to the citizens of Europe and the world. By coordinating the financial and intellectual resources of its members, ESA can undertake programmes and activities far beyond the scope of any single European country. ESA develops the launchers, spacecraft and ground facilities needed to keep Europe at the forefront of global space activities.



Airbus Defence and Space is a division of the Airbus group, formed by a merger between the businesses of Cassidian, Astrium and Airbus Military. This new division is Europe's number one in the space and defence industry, the world's number two in the space industry and is one of the world's top ten defence industry companies. It has annual revenues of around €14 billion with a workforce of some 40,000 employees.



UKspace is the trade association of the UK space industry, dedicated to representing the interests of its Members and supporting them in growing and developing their businesses. UKspace is sponsored by ADS (the aerospace, defence and security trade body) and techUK (the IT, telecommunications and electronics trade body).

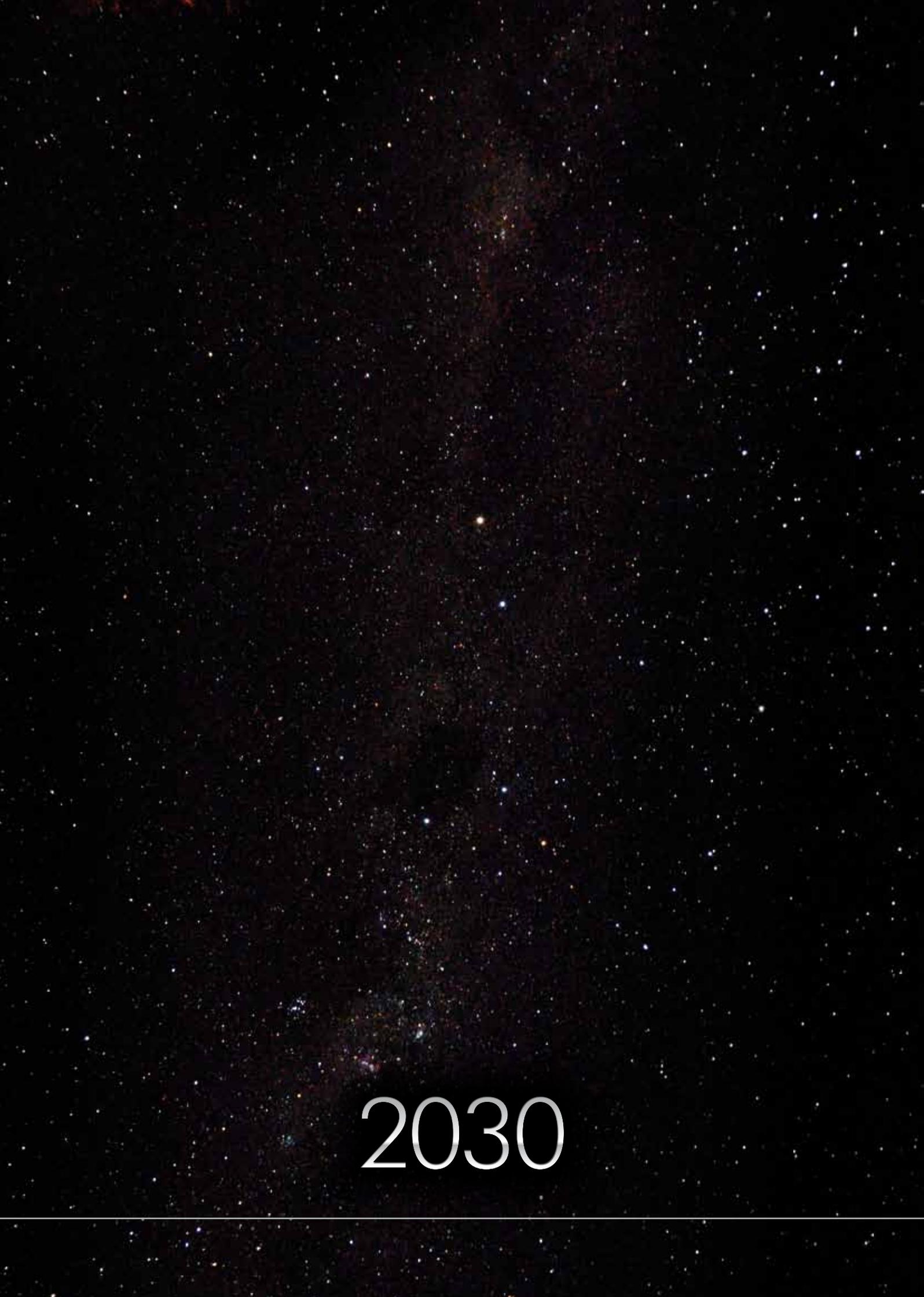


The UK Space Agency is responsible for all strategic decisions on the UK civil space programme and provides a clear, single voice for UK space ambitions. At the heart of UK efforts to explore and benefit from space, the UK Space Agency is responsible for ensuring that the UK retains and grows a strategic capability in space-based systems, technologies, science and applications. It leads the UK's civil space programme in order to win sustainable economic growth, secure new scientific knowledge and provide benefit to all citizens.

Satellite Applications Catapult

Electron Building Fermi Avenue Harwell Oxford Didcot Oxfordshire OX11 0QR

T: +44 (0)1235 567 999 W: sa.catapult.org.uk E: info@sa.catapult.org.uk [@SatAppsCatapult](https://twitter.com/SatAppsCatapult)



2030