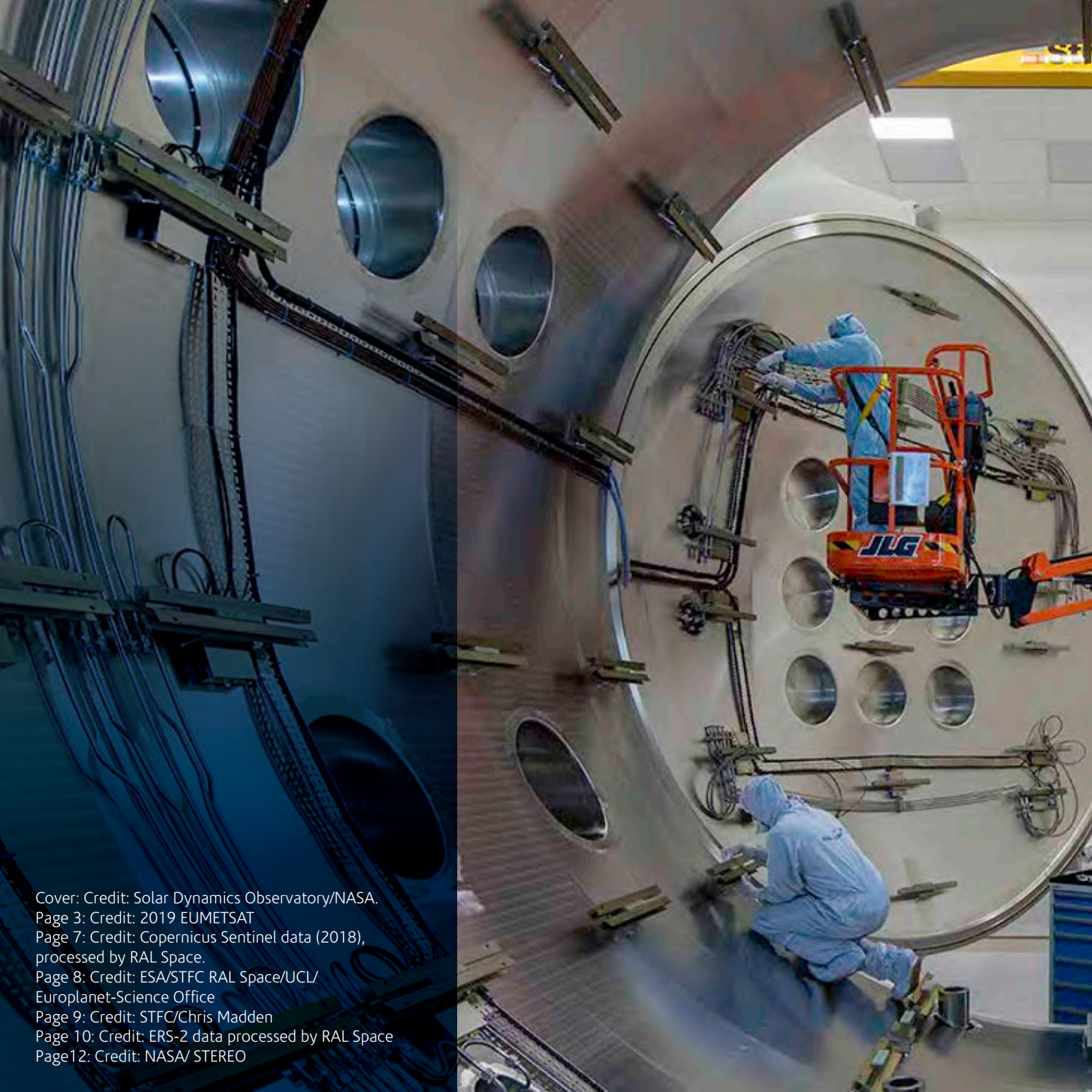
RAL Space

Strategy: 2019

Science driven,
technology enabled

Science & Technology Facilities Council

UK Research and Innovation



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Foreword

Professor Chris Mutlow, Director, RAL Space

RAL Space has been at the centre of the UK space community for more than half a century. We carry out a unique mix of scientific and technical research and development and provide and operate facilities for the space community. Our assets and expertise have enabled us to support this continually evolving sector from the very dawn of the space age.

We are now on the verge of a new space era. Commercial ventures are increasingly significant, technology allows us to explore more of our universe, and our lives on Earth are increasingly enhanced by space technology and satellite data. The UK government and industry have set an ambitious target to grow the UK share of the global space market to 10% by 2030 and UK Research and Innovation (UKRI) is delivering on the UK government's commitment to raise investment in research and development to 2.4% of GDP by 2027.

As the UK national laboratory for space, it is our role to stay at the forefront of scientific and technological developments and to help set the direction for the future. Our unique position between academia and industry means we are able to add value to both whilst retaining an objective, independent view. Our role in supporting UK growth in this sector can only truly be effective if we can evolve and grow with our community. This means having a strategy and delivery plan that are fit for the future and position us to meet new challenges.

This strategy outlines how our ambitions will support the UK space community and strengthen our position in it.

Professor Chris Mutlow,
Director STFC RAL Space

Vision

The UK's national laboratory advancing the understanding of space and our environment for the benefit of all.

RAL Space supports the UK space ecosystem by carrying out world-class science research and technology development. Our activities and our facilities enable scientific research in disciplines such as climate science, space weather and astronomy. With over 50 years of experience in space programmes, we have had significant involvement in more than 200 instruments on missions to date.

As a department within the Science and Technology Facilities Council (STFC), RAL Space is the space hub of UKRI. We deliver its mission to work with partners to ensure that world-leading research and innovation continues to grow and flourish in the UK.

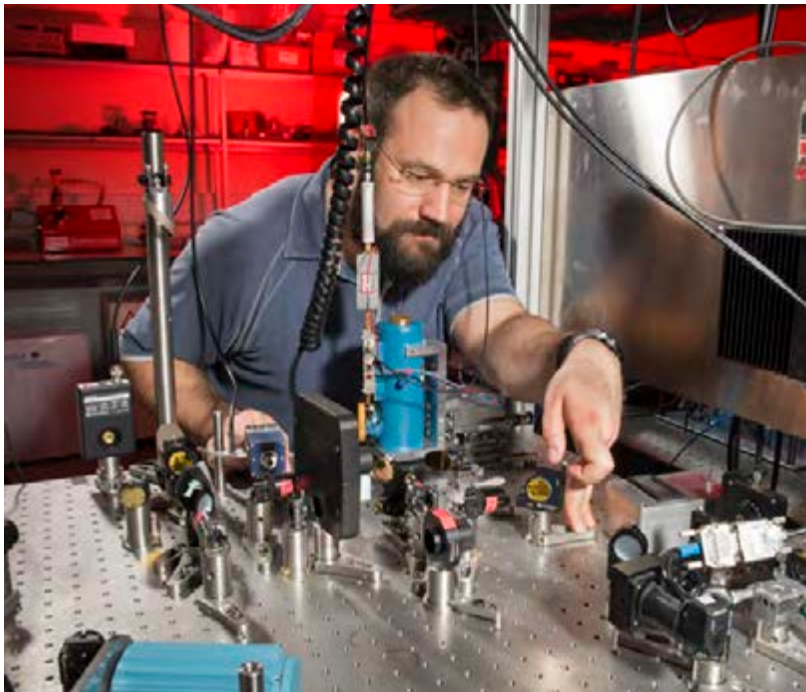
RAL Space collaborates with colleagues in the UK and internationally, leading on a range of scientific research and technical R&D. Our expertise and the technology we develop impact far beyond the space sector, with spinout companies commercialising our technology for applications as diverse as healthcare and industrial monitoring. We undertake cutting-edge engineering projects, accepting a higher level of risk than industry, and managing this through the skills and commitment of our staff.

Our facilities, including the National Satellite Test Facility (NSTF), form a fundamental part of the international space sector. They play a vital role in pre-launch qualification and calibration of instruments. They also provide the equipment and specialist staff businesses and universities need to grow and to make scientific breakthroughs.

Our heritage, skilled workforce and infrastructures position us to contribute to the successful delivery of the UK Government's Industrial Strategy, aiming to make the UK one of the world's most innovative economies.

RAL Space is evolving in order to continue to support our community. Significant investment to establish the NSTF has changed the balance of activities with which we are involved. It is this dual support of science and facilities, which RAL Space uniquely offers as the UK national laboratory for space. We will continue to support UK academia through collaborations, services and technology development, whilst supporting the UK space industry through contract research and access to world-leading facilities. This mix, and our ability to facilitate cross-pollination of ideas is pivotal in generating a vibrant innovative space community.

This strategy sets out how we will ensure that our unique position between industry and academia continues to strengthen the UK space community over the next ten years. The strategy will be underpinned by a delivery plan, setting out our priorities and the actions we will take to support our community and deliver these strategic objectives.



Strategic Objectives and Enablers

The UK's national laboratory advancing the understanding of space and our environment for the benefit of all

To deliver excellence in scientific research, data services and technology development

World-class research

To develop, build, and operate space facilities of international standing

World-class multidisciplinary facilities

To be at the heart of a vibrant and integrated space community

World-class innovation

To attract and grow a highly skilled and creative workforce for the UK space sector

World-class skills

World-class research

1. To deliver excellence in scientific research, data services and technology development

Achieved through:

- Cutting edge scientific and engineering research and leading instrument development for major international missions for space science and Earth observation
- Production and exploitation of unique data sets for research on climate, environment and other applications
- Providing internationally renowned support service for the science community including innovative data services and mission operations
- Being responsive to our community by regularly reviewing and refreshing our science and technology goals through road mapping exercises with our key stakeholders

RAL Space has had significant involvement in more than 200 space-borne instruments in the past 50 years. To be truly world-leading, we need to focus our expertise on a number of key, strategic scientific areas, to be set out in our delivery plan, which will support the UK's objectives in space science and Earth observation.

One of our key strengths is the connections we have to academia, industry and space agencies. It is in this position that we see our value in supporting the UK space sector. As part of the academic community, we work together on the conceptual design of space missions and instruments.

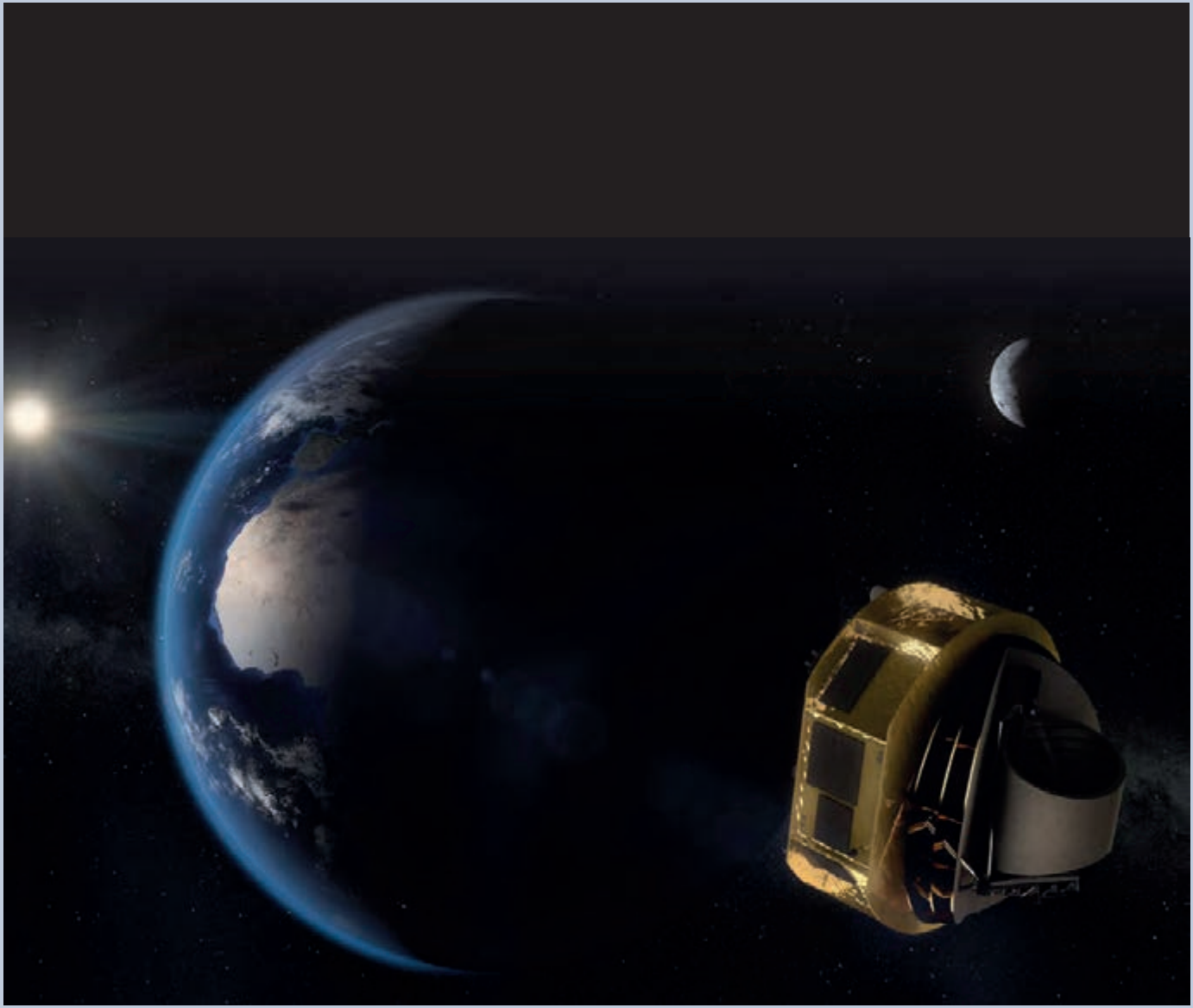
This enables us to lead and support international space missions. We will provide our expertise where high risk and technically challenging engineering and research projects are too large or long for academia and too risky for industry. We will help UK scientists to attain principal investigator roles and continue to underpin new scientific advances beyond RAL Space through our instruments and facilities.

We hold ourselves up to international standards of excellence. This requires regular peer review, by our scientific and technological steering groups, of the work that we choose to undertake and the quality of our publications and outputs. We will prioritise research that meets the strategic objectives of our key stakeholders, identified through our frequent interaction with these directly and through steering groups.

Science does not stand still. Scientific knowledge, technological advancement and shifting societal priorities all shape the direction of scientific endeavour. We also need to be agile to respond to a changing landscape and to identify strengths we can bring to emerging challenges.

Case Study: Cutting-edge science and engineering

During a 4-year mission, ARIEL will observe 1000 planets orbiting distant stars, enabling the European science community to answer questions about the chemistry of exoplanet atmospheres. RAL Space is the engineering lead for the ARIEL payload, providing technical expertise, project management and test facilities to the European Consortium, supporting the UK-based Principal Investigator at University College London.



World-class multidisciplinary facilities

2. To develop, build, and operate space facilities of international standing

Achieved through:

- Developing world-class environmental test and calibration facilities that will support the development of space instrumentation in UK academia and industry
- Fostering research and development facilities that underpin our own technology development and to provide fair access for the benefit of the UK
- Advancing our environmental data services to help further understanding of the Earth
- Establishing UK space surveillance and tracking capabilities at the Chilbolton Observatory to play our part in maintaining the space environment for the future

To support the UK space and environmental science community and enable research across UKRI, we deliver a broad set of facilities and services. These include our expanding environmental test facilities for satellites, data services such as the JASMIN computing facility alongside STFC's Scientific Computing Department, and operational space-borne and ground-based instruments such as STEREO and EISCAT in collaboration with our international partners.

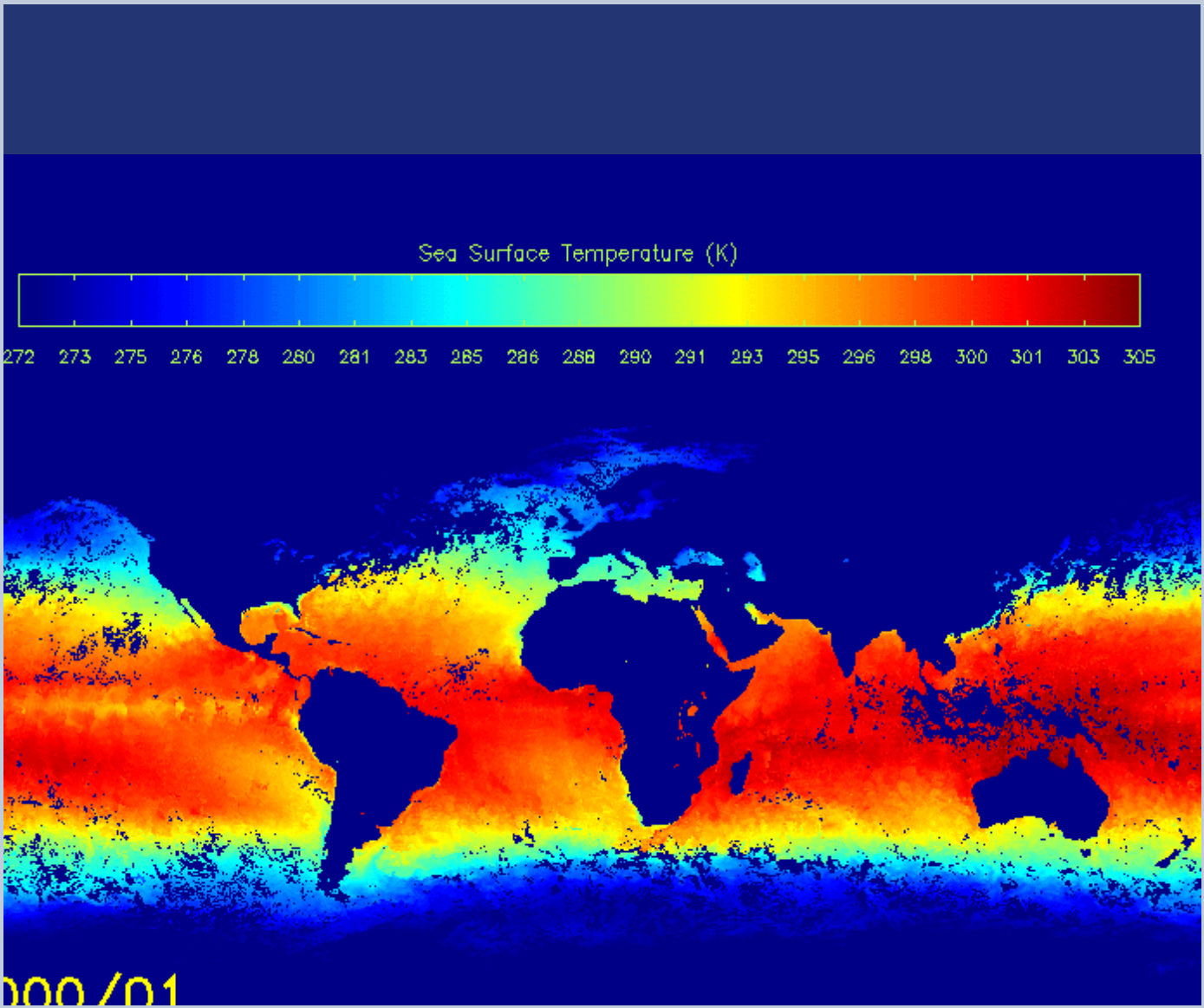
We will continue to operate our current suite of facilities and offer fair access in support of the UK community. The facilities we provide benefit from our deep expertise in areas of science, research and technology development. We will continue to evaluate the best ways in which we can support the needs of the community building on our existing strengths and heritage.

The new services and facilities we will develop over the next few years include the UK space surveillance and tracking capabilities at the Chilbolton Observatory and the NSTF. By expanding our existing space test facilities we will make sure we are providing the right facilities for the UK space sector to strengthen its world-leading position manufacturing satellites and instrumentation.

As we move to a model where our facilities and infrastructure play an increased part in how we support the community, we need to evolve our review processes and evaluate the effectiveness of the support we offer and ensure we continue to meet our stakeholder requirements.

Case Study: Advancing our environmental data services

Dr Jon Seddon, Senior Scientific Software Engineer, UK Met Office "The PRIMAVERA project allows one hundred scientists from across Europe to work together to analyse 2 PB of climate simulations generated by seven European modelling centres. JASMIN is probably the only facility in Europe (and the world) that would allow PRIMAVERA to do its research. The project has provided simulations and predictions of global and regional climate with unprecedented detail, for the benefit of governments, business and society."



World-class innovation

3. To be at the heart of a vibrant and integrated space community

Achieved through:

- Supporting the development of the Harwell Space Cluster
- Providing an independent technical viewpoint to shape UK space policy
- Enabling our staff's participation and engagement in national and international committees
- Developing and maintaining strategic partnerships and collaborations internationally through an active communication and relationship management programme

The Harwell Space Cluster has grown up around RAL Space to include over 90 organisations employing more than 1000 people by 2019. Our reputation, facilities and services have been a catalyst for this growth with many partners citing close access to RAL Space as a reason for their investment on the Campus. We will strengthen the development of the Harwell Space Cluster by supporting new partnerships and inward investment.

As a national laboratory, our sphere of influence stretches beyond Harwell. We are seen as a trusted partner by those who know us, but need to work to broaden our engagement across the UK to realise new partnerships and support new users of our facilities, including new entrants to the space industry. The breadth of expertise within RAL Space covers not only the technical but also softer skills such as quality assurance, auditing and the legal aspects of the space industry. We can assist the growth of UK SMEs in this challenging sector by sharing our experience.

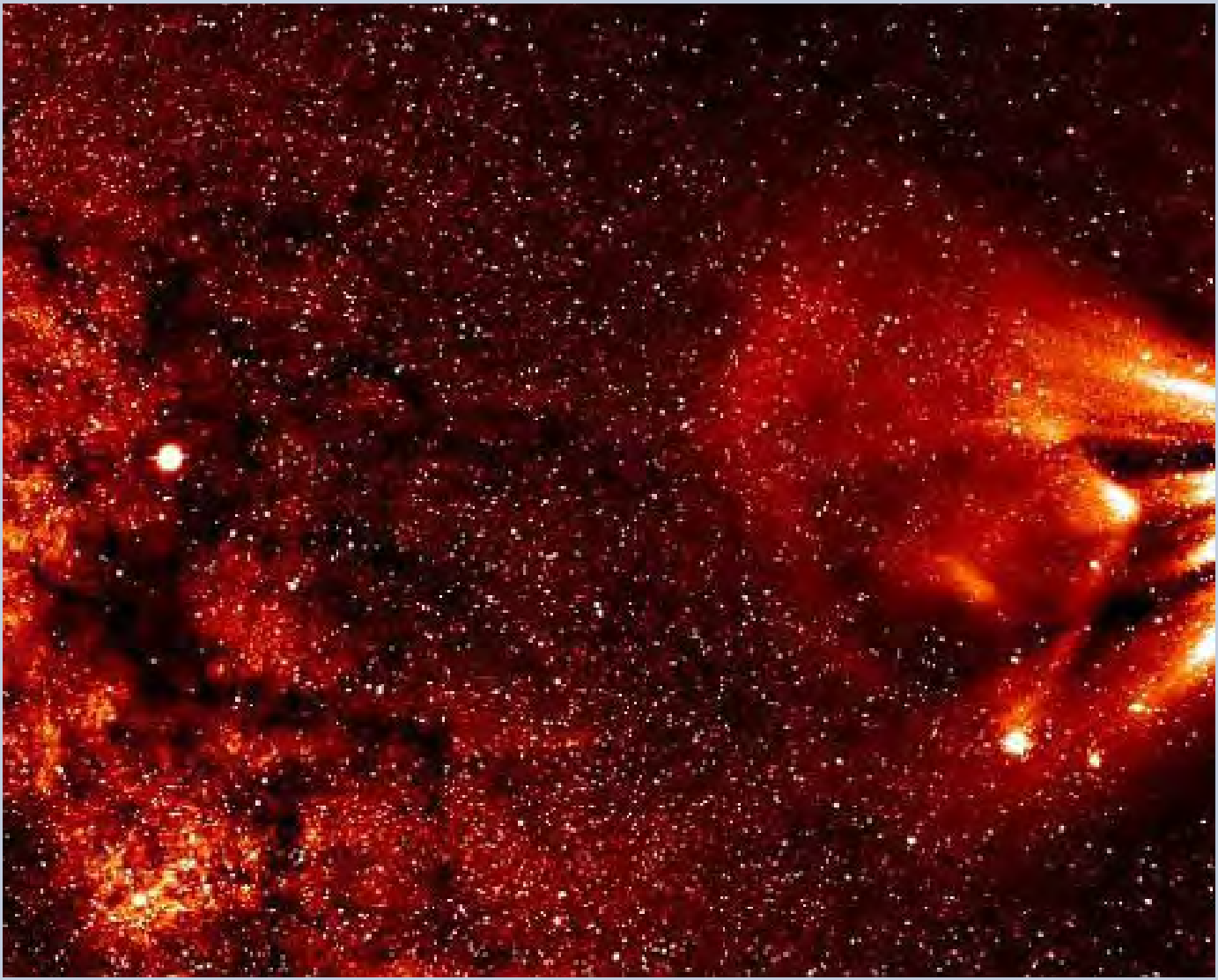
We also have a strategic role on behalf of the UK government. We are the bridge of technical expertise between the academic and commercial players and the government, particularly the Department for Business, Energy and Industrial Strategy (BEIS) and the Department for Environment, Food and Rural Affairs. As part of UKRI, and working closely with the UK Space Agency and our partners in other government bodies, we will help shape the UK's space policy and provide technical guidance on the future needs of our communities.

Internationally, we will seek to influence research programmes and to develop new opportunities in newly emerging space nations as well as through our existing relationships with NASA, European Space Agency (ESA), EUMETSAT and the European Union. We will work alongside our partners in the government to earn key representational roles in the bodies that shape the international space research community. We will also seek to facilitate new partnerships between our networks in the UK and other countries and to use our technologies to help find solutions to global challenges.

To achieve this, we need to ensure that we have a credible, compelling and consistent voice as the sector continues to grow. We need to strengthen and refresh RAL Space's reputation as a trusted partner for the space community and draw on our heritage to showcase our impact and inspire the public. We will be seen as a champion for new ideas, innovation and talent.

Case Study: Providing an independent technical viewpoint

A major space weather event could cause more than €15 billion of damage in Europe. Space weather can disrupt the Earth's protective magnetic bubble and upper atmosphere, affecting the satellites we rely on for navigation, weather forecasting and telecommunications and could even affect terrestrial power grids. The UK government is taking steps to understand and mitigate the impacts of space weather, which is part of the National Risk Register. RAL Space advises the Met Office, the BEIS, and the Cabinet Office as part of the Space Environment Impact Expert Group. This group provides scientific expertise to examine potential scenarios, assess the impact and plan for the UK's response.



World-class skills

4. To attract and grow a highly skilled and creative workforce for the UK space sector

Achieved through:

- Training apprentices, undergraduate and graduate students to be expert and active participants in the space sector
- Strengthening our permanent teams of professional and appropriately skilled staff through training, staff development programmes and supporting professional qualifications
- Fostering a diverse and balanced workforce
- Partnering with other organisations to share our expertise and knowledge

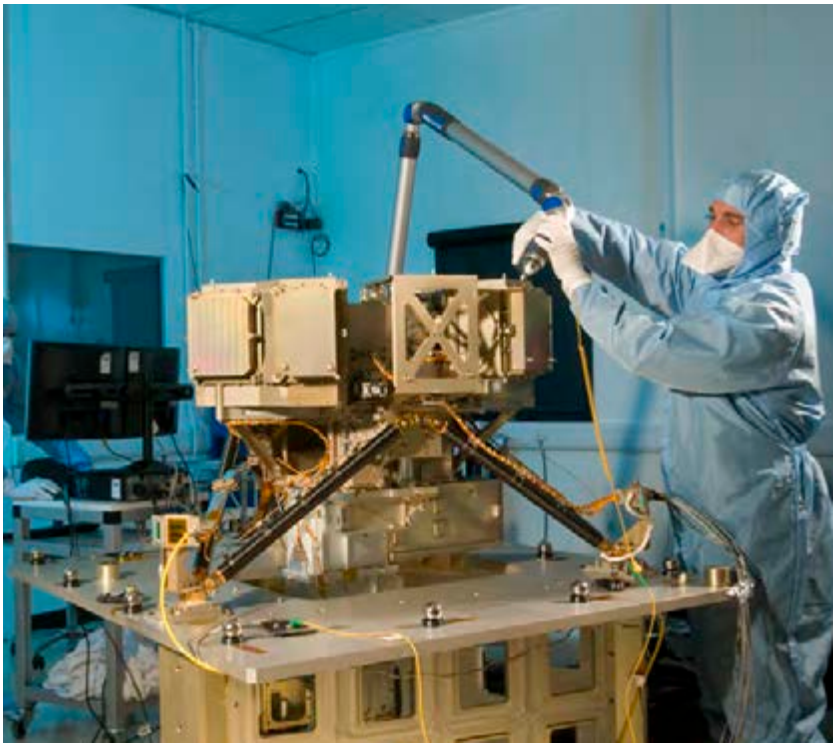
For RAL Space to remain at the forefront of the UK space community, we need to ensure that we attract and grow our team of professional and skilled staff. This includes the training of apprentices, undergraduate and graduate students, by providing early careers schemes, sandwich course and summer placement opportunities and co-supervision of Masters and Doctoral students.

We will use the best methods to recruit the people with the right skills. This includes high calibre engineers and scientists, who can lead and deliver our space and R&D programmes, experts in project management and business development, who can ensure that we maximise our influence within the space community, and staff to provide the essential underpinning technical scientific expertise and support we need to ensure we can deliver our goals.

We want our staff to flourish. Our staff are encouraged to benefit from a wealth of training and leadership opportunities to continuously develop their skills. We offer professional challenges by giving staff the opportunity to explore their technical creativity on high profile and disruptive projects.

The Space Growth Partnership sets out that for the sector to achieve its growth targets, it will need to attract and train up to 30,000 additional skilled people by 2030[4]. As an expert laboratory we play a key role in upskilling the UK space community. Our research programmes and facilities are a training ground for industry and our staff are well placed to share their expertise through our university partners and exchange programmes, enriching skill sets in the wider community.

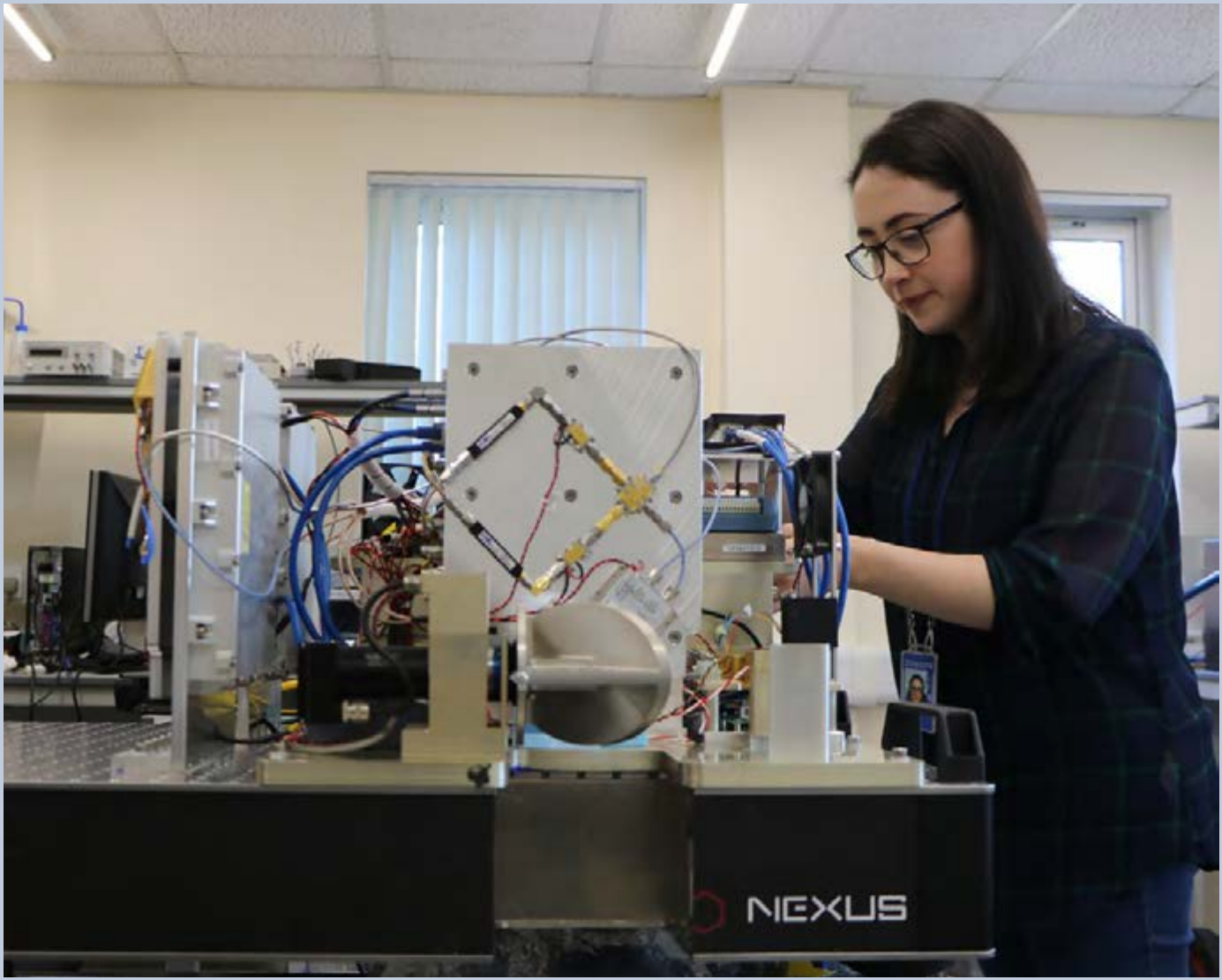
Our outreach programme will use the excitement of our work to inspire young people in order to raise science capital and attract the necessary diverse pool of talent needed for the future. By focusing on increasing engagement with science within societal groups where this is traditionally low, we will play our part in national efforts to increase the uptake of science, technology, engineering and mathematics.



4. Prosperity from Space: A partnership strategy for the UK, May 2018, Space Growth Partnership

Case Study: Training active participants in the space sector

Eimear Gallagher, a Physics with Astrophysics student at Nottingham Trent University completed her university placement year in the Millimetre Wave Technology Group. As part of her year, she helped develop an instrument for the Large Millimetre Telescope. As well as using her technical skills in a world-leading team, Eimear had the opportunity to develop teamwork and communications skills as part of an international collaboration, both from the UK and while visiting the telescope in Mexico. She was awarded the Royal Astronomical Society Patricia Tomkins Undergraduate Prize in 2019 for her work at RAL Space.



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