

Science & Technology drive to deliver UK space launch

- Science & Technology Portfolio launched to support new projects across Defence
- More than £2 billion of R&D funding allocated between now and 2026.
- New space sensors to be launched from UK later this year

A new, ambitious Defence Science & Technology agenda, backed by £2 billion of investment and including an exciting new satellite launch, has been commissioned today.

Aimed at driving forward cutting-edge research and developing new Defence capabilities, the [Science & Technology Portfolio](#) outlines a series of ambitious programmes, encouraging industry collaboration and input to meet future Defence needs.

One ground-breaking project in the new portfolio is the [Coordinated Ionospheric Reconstruction Cubesat Experiment \(CIRCE\)](#) – a miniaturised space weather suite onboard two satellites – which will be launched later this year in partnership with the US Naval Research Laboratory.

The CIRCE mission will see three miniature sensors fixed to two cereal box-sized satellites to collect data on space weather as part of Virgin Orbit's Launcher One rocket from Spaceport Cornwall in Newquay later this year.

The miniature sensors have been developed for the Defence Science and Technology Laboratory (Dstl) by University College London, the University of Bath, and Surrey Satellite Technology Ltd, and drawing on expertise from the University of Surrey. They will monitor changes within the ionosphere – a layer of the Earth's atmosphere about 80 to 1,000 km above the surface – where variations in the environment can interfere with the operation of GPS, communications and sensing technology.

Paving the way for similar technology to be used on future satellite deployments, the miniature sensors could expand the ability to collect measurements in space to enhance space weather modelling capabilities. This knowledge would assist our Armed Forces to maintain communication and intelligence capabilities on the frontline.

Minister for Defence Procurement, Jeremy Quin, said:

Exploring and using space is crucial for developing cutting-edge Defence capabilities that will ensure our Armed Forces can operate at the highest level anywhere on the battlefield.

We are investing record amounts across our science and technology portfolio to ensure the UK remains at the forefront of innovation and sustains its strategic advantage over our adversaries.

Air Vice-Marshal Paul Godfrey, Commander of UK Space Command, said:

Defence science and technological activity in space has never been more important, whether it is in support of military operations or helping to combat climate change, defence innovation is at the forefront of this work.

After it enters orbit from Spaceport Cornwall, CIRCE will enhance our understanding of space weather and help us to keep critical satellites safe from the many hazards associated with operating in space.

The CIRCE mission forms just one element of a broader Science & Technology Portfolio announced today, aimed at driving forward cutting-edge research and developing new capabilities that currently do not exist anywhere around the world.

Building on previous projects including testing autonomous systems and developing state-of-the-art capabilities for our F-35 fighter jets, the MOD will work with the best of British industry and academia to develop new and exciting defence technology.

£2 billion will be invested between now and 2026 to develop programmes which underpin the development of the generation-after-next of military capabilities. Key elements of the future-facing portfolio include:

- Plans to develop a new weapon demonstrator capable of operating up to hypersonic speeds to better equip our Armed Forces against future threats.
- Expanded research into AI technologies, better understanding how they can benefit service personnel on the front line.
- Investment to build defence capabilities in space, improving intelligence, communication, and surveillance.

The £2 billion outlined is part of the £6.6 billion investment into research and development following the £24 billion increase in the defence budget announced in the 2021 [Defence Command Paper](#). Designed to meet the MOD's capability needs, the Science & Technology portfolio will ensure the UK Armed Forces have access to the newest and most cutting-edge technology.

Dstl Chief Executive Dr Paul Hollinshead said:

Dstl's world-class scientists are committed to delivering the best scientific advice and technological solutions, giving the armed forces operational advantage, the edge in decision making, and saving lives.

The new portfolio will see defence enhancing its hypersonic research

programme alongside significant science and technology investment in AI, cyber, electromagnet activities, novel sensors, advanced materials, space and support to the nuclear deterrent.

Flood Forecasting Centre: the Flood Outlook is changing

News story

Based on extensive user research, we are refreshing the way we present our monthly flood forecast.



The Flood Outlook provides a flood forecast for the coming month in England and Wales. It is issued twice a month.

Over the past 18 months, we have been working with our users to make our Flood Outlook service more useful.

The result is a redesigned, clearer, and more modern looking product, supported by new training materials.

This work responds to:

Product development

We have based the changes on extensive user and prototype testing. They include:

- revising how we present the flood forecast to support better decision making
- redesigning the front page so you can find the most important

information quickly

- reorganising the layout so that complementary information is now grouped together
- presenting the information in a clearer and modern style
- introducing a navigation bar so you can move around the document more easily

The Flood Outlook will continue to be based on a national scale assessment to provide an overview for England and Wales.

User research

The changes respond to our user research findings:

- the current product showing 'low' risk much of the time and the non-committal language does not support decision making
- the monochromatic colour palette and layout makes it difficult to quickly identify the most important information
- a need for a more intuitive presentation of the forecast based on colour codes
- a request for more information in the 6 to 10 day timescale, and on spring tides

They also incorporate feedback from our hydrometeorologists:

- that the requirement for forecasting 'significant impacts' results in a tendency to forecast a 'low risk' too often
- a need to be able to communicate known forecast information that may be useful to users
- decreasing the time steps of the forecast for the last 2 weeks to give a better representation of the accuracy of forecasts at this range

Product launch

The first issue of the refreshed Flood Outlook was on Friday 27 May 2022.

To help you understand the Flood Outlook short training videos are available:

We can also provide webinar training to organisations on request.

Signing up and more information

If you are already signed up for the Flood Outlook, you will continue to receive it as normal.

If you are a planner who needs to make decisions at a timescale of 6 to 30 days and think this product would be useful, contact FFCenquiries@environment-agency.gov.uk.

Published 7 June 2022

Last updated 6 July 2022 [+ show all updates](#)

1. 6 July 2022

Links to Flood Outlook training videos added

2. 7 June 2022

First published.

[CIRCE space weather suite announced for first UK satellite launch](#)

The Defence Science and Technology Laboratory's (Dstl) miniaturised space weather instrumentation suite will be one of the payloads aboard Virgin Orbit which is targeting the first UK satellite launch this summer from Spaceport Cornwall in Newquay. Virgin Orbit's Launcher One rocket takes off horizontally, carried aloft by a modified Boeing 747 jet, named Cosmic Girl.

The Coordinated Ionospheric Reconstruction Cubesat Experiment (CIRCE) satellite mission comprises two 6U cube-satellites that will be launched into a near-polar low Earth orbit in a string-of-pearls configuration (targeting 555 kilometres altitude). Each 6U satellite bus measures 10cm by 20cm by 30cm (the size of a cereal box), and will fly almost identical instrument capability on both satellites. Dstl is partnering with the US Naval Research Laboratory (NRL) on the joint mission.

The UK contribution to CIRCE is the In-situ and Remote Ionospheric Sensing

(IRIS) suite, complementary to NRL sensors and comprising 3 highly miniaturised payloads developed for Dstl by University College London (UCL), University of Bath, and Surrey Satellite Technology Ltd (SSTL), drawing on expertise from the University of Surrey. CIRCE will characterise a region of the space environment, the ionosphere, which is important for a range of defence and civil applications and can impact GPS, communications and sensing technology – both in space and on the ground.

All 3 IRIS payloads together occupy a small volume no more than 10cm by 10cm by 20cm. Miniaturisation of space weather sensors means that a significant capability is packed into each satellite bus provided by Blue Canyon Technologies. This type of miniaturisation could pave the way for deployment of many more such sensors as a routine inclusion on other satellites thanks to their small size, weight and power. The result would expand data collection for the near-Earth space environment, and enhance space weather modelling capabilities.

Understanding space weather is crucial to the safe operation of satellites. Solar flares and geomagnetic storms can severely impact satellites in space, as highlighted by the recent loss of 40 Space X Starlink satellites in February 2022.

Image: CIRCE mission patch

During the mission the satellites will be operated from a series of ground stations in conjunction with international partners. As well as data collection, the miniature satellites will act as technology demonstrators, with their utility and performance being assessed to de-risk future missions.

A unique aspect of the CIRCE mission is the ability to characterise the same volume of space within a very short return period, enabled by the constellation of 2 near identical spacecraft actively maintaining a lead-follow configuration in the same low Earth orbit, separated by 250 to 500 kilometres. A single satellite in low Earth orbit has an approximately 90 minute revisit period; a multi-satellite constellation would improve on this, but it is the dual-nature of the 2 relatively closely-spaced CIRCE satellites that is anticipated to provide unique insights into the temporal dynamics associated with specific ionospheric structures.

Air Vice-Marshal Paul Godfrey, Commander of UK Space Command, said:

Defence science and technological activity in space has never been more important, whether it is in support of military operations or helping to combat climate change, defence innovation is at the forefront of this work. After it enters orbit from Spaceport Cornwall, CIRCE will enhance our understanding of space weather and help us to keep critical satellites safe from the many hazards associated with operating in space.

Dr Paul Hollinshead, Dstl Chief Executive, said:

The CIRCE mission showcases the UK's academic and industry space capabilities and extends the physical boundaries of our collaboration. This joint endeavour with our US partners shows there are no limits to what can be achieved with our international allies.

Dr Paul Bate, CEO of the UK Space Agency, said:

The CIRCE space weather experiment will join a host of small satellites on board Virgin Orbit's first launch from the UK, and it's exciting to see the wide range of commercial, academic and government partners who will share this moment in history with us. We are on track to meet our ambition of becoming the first country to offer commercial launch services from Europe, catalysing investment into our growing space sector and creating hundreds of new jobs. I can't wait to see Cosmic Girl take to the skies above Spaceport Cornwall later this year.

Melissa Thorpe, Head of Spaceport Cornwall, said:

It's an honour that critical UK and US partnerships are to be launched from Cornwall and we are proud to support the facilitation of these international milestones. The mission aligns with Spaceport Cornwall's delivery of 'space for good', by bringing together partners from across the planet in a shared mission to support transformational space-to-planet communications and applications to benefit humanity.

IRIS

IRIS provides in-situ ionospheric particle and radiation measurements (INMS and RadMon), combined with remote-sensing of triple-frequency GPS signals to map the topside ionosphere and beyond (TOPCAT). The UK data will provide useful information in their own right, as well as providing contextual environmental information for CIRCE, and enrich the science that can be derived from NRL's triple tiny ionospheric photometry (Tri-TIP) ultra violet optics cameras, for tomographic specification of electron density.

The IRIS suite, integrated by SSTL, includes:

1. An Ion and Neutral Mass Spectrometer (INMS), developed by UCL's Mullard Space Science Laboratory, which will improve understanding of the variability of atmospheric drag, the chemistry of the thermosphere and the impact of space weather on the upper-atmosphere;
2. A Radiation Monitor (RadMon) from SSTL will identify areas of increased

radiation for satellites to avoid, help identify suitable orbits and shielding requirements for future satellites, and highlight dynamic radiation enhancements that can be cross-correlated with payload and subsystem anomalies;

3. TOPCAT, developed by Bath University's department of Electronic and Electrical Engineering, which will look at remote sensing of triple-frequency GPS signals, and validate the UK's Multi-Instrument Data Analysis System (MIDAS) tomography algorithm for the topside ionosphere and plasmasphere, by using total electron content (TEC) measurements from the differential phase of GPS signals, inverting them to derive the electron density of the region.

Find out more about [Dstl's space defence science and technology capability](#).

[NDA group employees honoured by Her Majesty The Queen](#)

News story

Three long-serving NDA group employees have been awarded honours by Her Majesty The Queen in the Platinum Jubilee Honours List for services to the nuclear industry and their local communities.



From left to right: Cath Giel, June Love and Cherry Tweed

Cath Giel, Communications and Stakeholder Relations Director at the LLW Repository Site in Cumbria until her retirement earlier this year, was made a Member of the Most Excellent Order of the British Empire (MBE).

She is joined by Professor Cherry Tweed, Nuclear Waste Services Chief Scientific Advisor, and June Love, Community Relations Manager at Dounreay Site Restoration Ltd, who have also been awarded MBEs. Both are due to retire this year.

NDA Group Chief Executive David Peattie said:

The impact that Cath, Cherry and June have made, both to the nuclear industry and to the communities in which we belong, can't be underestimated.

Cumbria and Caithness and North Sutherland are better connected with our sites and are stronger communities because of Cath and June's contribution. We have also taken significant steps on the journey towards our long-term mission of constructing a Geological Disposal Facility thanks to Cherry's significant expertise and involvement in that important programme.

I'm sure everyone in the NDA group will join me in congratulating them and agreeing that this is well-earned recognition for their many years of service.

Cath Giel said:

I've been blown away by this tremendous recognition and feel grateful that I've had the support of those around me, both professionally and from the community, which has played a huge part in the many great achievements I've been involved in.

June Love added:

I was delighted to receive this honour and have been so humbled by all the messages and kind words received since it was announced. I feel privileged that I've received this award for contributions during my career.

Cherry Tweed said:

This is an incredible honour and came completely out of the blue. It's also a tribute to the committed and dedicated NWS team who support the UK's geological disposal programme.

Magnox Ltd and Dounreay Site Restoration Ltd Chair Lawrie Haynes was also recognised in the list. He has been made a Commander of the Order of the British Empire (CBE) for his voluntary service, supporting RAF personnel and veterans.

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Ministerial appointment: 7 June 2022

Press release

The Queen has been pleased to approve the appointment of Sir Christopher Bellamy QC as a Parliamentary Under Secretary of State in the Ministry of Justice.



The Queen has been pleased to approve the appointment of Sir Christopher Bellamy QC as a Parliamentary Under Secretary of State in the Ministry of Justice.

Her Majesty has also been pleased to signify Her intention of conferring a peerage of the United Kingdom for Life on Sir Christopher.

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