Speech: Global MilSatCom conference 2017

Let me begin by saying what a great privilege it is to speak at this conference. I am sure Harriet Baldwin would have expressed a similar sentiment if she not been obliged to attend to pressing business overseas, for which I apologise on her behalf.

As an arts graduate, I cannot profess to be a leading expert on orbital mechanics. But I am an enthusiast for space, and have been so since, as a 10 year old, I was taken by my parents to a mountain top in Fiji, where we then lived, to watch the re-entry of an Apollo mission. This was a magical experience for me. Not only was this a shooting star with men in it, as it appeared to me, but I realised that it was a very significant moment because my parents awoke my sister and I at one am to begin the journey to the mountain, an hour of the day I had never seen before!

And later in my life, as a tank soldier prone to getting lost at night, trying to read a map with a red torch and red contour lines, I marvelled and thanked the Lord for the arrival of GPS navigation. Still later, as a Brigade Commander in Iraq, I was hugely grateful for what satellite communications could do for us.

So I'm pleased to now find myself as the commander of the UK's Joint Forces Command, responsible, amongst other things, for C4ISR, including cyber, special forces, and joint warfighting, because I am in a position to put my enthusiasm and belief in space to good use.

The UK has been a space faring nation for decades. We launched the first Skynet satellite in 1969. Since then, you and your colleagues have built a thriving space industry, generating a turnover of £14 billion a year and employing about 40,000 people in the UK.

The UK is a world leader in certain technologies: 40% of the world's small satellites are built in the UK, and a quarter of the world's telecommunication satellites. And the space systems and services generated by the UK space sector support a wide range of applications across wider society: more than £250 billion of our gross domestic product is supported by satellite services.

Satellites are the reason we can make mobile phone calls, take money from cash machines, ensure our emergency services get to where they need to, and a whole range of activities vital to our daily lives.

Defence is just as dependent. More than 90% of the platforms and systems that constitute the UK military equipment programme are dependent on space to some degree. It is space based capability, much of it benefitting from US investment, that has enabled modern information warfare and precision attack. It is this dependence, combined with our appreciation of the growing threats

and hazards, which has led us to increase the attention we are giving to space.

How are the risks increasing? From both natural and manmade sources. There are the dangers of ‘space debris’, remains of previous spacecraft orbiting the Earth that travel at speeds of up to 17,500 miles per hour, and environmental hazards like geomagnetic storms, which can damage Earth orbiting satellites.

We also have to recognise that potential adversaries see the reliance on space by the UK and our allies as an important vulnerability, and are developing weapons that can exploit that vulnerability. Russia and China have both admitted to developing direct ascent anti-satellite missiles.

This should concern all of us: the testing of such weapons in 2007 by the Chinese government created at least 2,000 pieces of space debris, threatening the sustainability of this shared domain.

But there are positive changes taking place as well, principally around commercial investment in space related R&D. As in the field of micro-electronics, it is no longer governments and defence departments who are driving innovation, and this is leading to greater accessibility and lower costs. Which is good, because our demand for space services continues to increase.

Be it new launch capabilities, mega-constellations, or satellites that provide on orbit repair and refuelling, the space market is evolving in a way that opens up new opportunities for the further exploitation of space.

As this market continues to develop, we will work together to ensure the continued security of the space domain. We cannot take this for granted: our dependence is great and growing, and the space environment becomes progressively congested and competitive. Gone are the days when we could launch satellites into space and expect them to operate unchallenged.

Our government recognises the vital importance of working closely with industry on these matters. That is why it published a National Space Policy and acknowledged the importance of space to our prosperity and security in the 2015 Strategic Defence and Security Review.

This included a number of commitments. One was to invest in space surveillance capability, enabling us to further assess space threats, risks and events, both natural and man made. Another was to invest in multi-signal satellite navigation receivers, which will enhance the resilience of the armed forces and emergency services to the loss or disruption of GPS service. And a third was the commitment to enhance our Space Operations Centre and invest in a ballistic missile defence radar that would also enhance our space situational awareness.

As we develop our strategy and capabilities in response to these changes, we will look to secure our freedom of action in, to and from space, fully exploiting its military and civil potential. The emerging themes of our space

strategy are as follows:

- optimising space support to the front line, making sure our forces can absolutely depend on getting the services they need
- enhancing the protection and resilience of space based assets, keeping safe the space assets that underpin our military and civil national security, and
- complementing cross-government space activity, to maximise the opportunities that arise from coordinating matters of security and prosperity

Nick Ayling will elaborate on these points in the next session, and Air Commodore Nick Hay will discuss in more detail how this applies to our future military satellite communications capability. So let me finish by highlighting the overarching importance of strong relationships to the delivery of our ambitions.

We must work closely with our industrial partners in the space sector to exploit innovative emerging technologies.

We must work closely with our allies, following the principles of "international by design" to deliver joint force advantage in space, much like we do in every other domain.

As with every other aspect of Britain's safety and security, it depends not just on our own efforts, but on working with our allies to manage common threats and hazards that face us all. And this is at least as true in space as anywhere else.

Our relationship with the US on space has traditionally been close: the radar at Fylingdales has long contributed to US led networks. And as we develop the next generation of Skynet we will ensure it is as interoperable as possible with US and allied systems. This will be made possible by the framework provided by the Combined Space Operations initiative, through which we are seeking a safe, secure and resilient space environment.

And the UK's departure from the European Union will not prevent us from working with our European neighbours on matter of space security. As well as working bilaterally with member states, the UK will seek the closest possible participation in EU space programmes such as Galileo, commensurate with the contribution that UK government and industry has made to date, and where we can continue to add real value.

In conclusion, space offers great opportunities. But the strategic context is much like it is here on Earth: becoming less certain, with increasing threats that will take skill and commitment to manage successfully. And that is what we must do. You must judge us by our actions rather than our words as we pursue these goals, but I very much hope you will work closely with us, and our allies as we seek to protect our interests and enhance our capabilities.

I look forward to our continued close working between defence and industry on military programmes, particularly Skynet 6.

News story: UK steps up commitment to European security

Speaking at the NATO Defence Ministerial in Brussels, Gavin Williamson will commit four RAF Typhoons to the Southern Air Policing mission in Romania next summer. Following a successful rotation last summer, the fast jets will be redeployed to the country, working with our Romanian allies to police the Black Sea skies.

Marking a further commitment to Europe, the Defence Secretary will announce that the UK is stepping up in the Western Balkans. In addition to the troops already based in Kosovo, supporting peace in the country, and our contribution to the EU's Op Althea in Bosnia and Herzegovina, from next year a Battalion will be held at high readiness to respond to any situation in the region. This will see 600 soldiers ready to move into the region at short notice.

Defence Secretary Gavin Williamson said:

> In the face of an increasingly assertive Russia, the UK has significantly stepped up its commitment to Europe and today I can confirm a further package of support, showing how we remain at the forefront on European security.

> We are standing by our allies across air; deploying Typhoons to Southern Air Policing in Romania, land; increasing our support to the Kosovo peacekeeping operation, and sea; with HMS Ocean returning to the NATO Standing Maritime Group.

The Defence Secretary will also welcome the return of HMS Ocean to one of NATO's Standing Maritime groups, following its redeployment to the Caribbean to help in the hurricane recovery.

News story: Robotics and AI: projects to create safer work for people

UK businesses and researchers will share £68 million with the aim of

supporting safer working practices for people in extreme environments that could prevent potential harm and increase productivity.

The projects will each support the research and development of robotics and artificial intelligence (AI) technologies for use in industries such as offshore and nuclear energy, space and deep mining.

Minister of State for Climate Change and Industry, Claire Perry, announced the funding today at Innovate 2017. It is part the government's £93 million programme for robotics and AI in extreme environments, which is being funded through the Industrial Strategy Challenge Fund.

Across research and innovation

Investing in business

Innovate UK is giving funding to a range of projects for robotics and AI systems development. £16.5 million will be shared between 70 businesses, 13 universities and 10 research organisations for collaborative research and development projects. A further £3 million will go to 17 demonstrator feasibility studies.

Some of the projects include:

- using autonomous submarines to determine the ice risk hazards for shipping or the installation of energy assets in the Arctic. Project lead, Thurn Group will use autonomous vessels to survey ice retreat to better understand the threats of the surviving ice, to plot when it's safe for people to use shipping routes or install or make changes to infrastructure
- integrating autonomous drones to inspect offshore-wind farms. Currently, a boat with crew has to go out to each turbine to carry out inspection and assess blade faults. A system that automatically deploys and recovers drones for monitoring would remove the need to send people into potentially dangerous seas or oceans while reducing costs and time. Perceptual Robotics are the lead
- manufacturing in space, such as the potential for in-orbit manufacture. This could be used for small replacement parts and tools, and possibly even large structures and spacecraft. BAE Systems are the lead

Robotics and AI in extreme environments. ISCF winners: Perceptual Robotics.

Ruth McKernan, Chief Executive of Innovate UK, said:

> These pioneering projects driven by the very best minds in UK research and industry exemplify the huge potential of what can be achieved through the Industrial Strategy Challenge Fund and the long-term benefits for the UK economy.
>
> These are just the first competitions in robotics and AI. There will be further opportunities for businesses in the coming months.

Robotics and AI in extreme environments. ISCF winners: Thurn Group.

Hubs for research

A £44.5 million investment will be made into 4 research hubs for world-leading research and robotic solutions. This will be managed by the Engineering and Physical Sciences Research Council (EPSRC). Commercial and international partners will support with an additional £51.6 million investment.

The hubs will lead investigations in the areas of off-shore energy, nuclear energy and space, opening up new cross-disciplinary opportunities which are not currently available. The UK Space Agency is co-funding one of the hubs.

Professor Philip Nelson, EPSRC Chief Executive, said:

> The robotics hubs will draw on the country's research talent to nurture new developments in the field of robotics and provide the foundations on which innovative technologies can be built. The resulting outcomes from this research will allow us to explore environments that are too dangerous for humans to enter without risking injury or ill-health.
>
> The Industrial Strategy Challenge Fund is helping us achieve a joined-up approach to research, discovery and innovation.

Sensors for the ocean

To develop sensors capable of working in the ocean, Natural Environment Research Council (NERC) is investing £4.3 million into 5 research projects by the National Oceanography Centre, the University of Exeter and University of Southampton.

The sensors will help researchers to answer questions about our changing oceans, such as how carbon dioxide moves between air and water, as well as monitoring the health of cold-water corals in marine protected areas. They will be compatible with existing marine robotic vehicles and those in development.

NERC's Chief Executive, Professor Duncan Wingham commented:

> Sensors help us to better understand our oceans and manage them sustainably for the future.
>
> The projects will develop ambitious new technologies that work in hazardous and extreme environments, maintaining the UK's world-class status in marine robotics. Other industries, such as the water, aquaculture and industrial waste, are also likely to benefit.

About the Industrial Strategy Challenge Fund

The Industrial Strategy Challenge Fund is part of government's Industrial Strategy, which will ensure the UK continues to be one of the best places in the world for science and innovation.

Innovate UK and the Research Councils are taking a leading role in delivering this funding across the country. This will allow the UK to secure maximum benefit.

Research and analysis: Soil screening values for assessing ecological risk

This project has produced guidelines for screening the risks to soils from chemicals released through the landspreading of waste-derived materials.

The project reviewed the available evidence on the direct terrestrial ecotoxicity and potential for secondary poisoning of 38 chemical substances and mixtures, including 23 trace elements and 15 persistent organic pollutants. Although there were insufficient data to derive an assessment criterion in all cases, soil screening values are recommended in the report for 9 trace elements and 8 organic pollutants. A spreadsheet tool allows the screening values to be adjusted for site-specific soil properties.

The soil screening values developed through this project will help the Environment Agency to better review the technical suitability of landspreading proposals submitted by an operator for a wider range of chemicals.

News story: UKHO features in new UK Chamber of Shipping film

Focusing on their role as the UK's hydrographic and marine geospatial agency, the film gives an insight into the vital role the UKHO played in the arrival of HMS Queen Elizabeth into Portsmouth. The UKHO analysed and verified bathymetric data about the depth and nature of the seabed to ensure safe passage.

It also explores their international responsibilities as the Primary Charting

Authority for 71 nations. As well as charting these waters to support safe navigation, the UKHO helps small island states to sustainably manage their marine resources by helping them to build their knowledge of their marine environment. This work brings economic benefits and can help to build resilience to the impact of climate change and natural disasters.

More recently, the UKHO supported relief efforts in the Caribbean in the devastating wake of Hurricane Irma. By providing emergency navigational charts to the British Virgin Islands within 24 hours, this enabled ships to safely bring in emergency supplies.

The film demonstrates the wide range of location-based information the organisation handles from its office in Taunton, Somerset. Chief Executive John Humphrey explains:

> Good marine information supports trade, tourism, civil defence, managing the marine environment. All of those different things require good information to be able to do them and we are the people who can provide that information.

By investing in new data capabilities and facilities, the UKHO is developing its world-class capabilities into the future.

You can view the UK Chamber of Shipping film below.

‘Sea Change’ – The United Kingdom Hydrographic Office