



HM Government

National Space Security Policy

Foreword

The National Security Strategy set out our commitment to a secure and resilient Britain, protecting our people, economy, infrastructure and way of life. For the first time, we are publishing a National Space Security Policy, recognising that space-based capabilities support the provision of vital services for our economy and national security.

The National Space Security Policy sets out how we will ensure our national access to these services, embrace opportunities which enhance our security and prosperity and make the United Kingdom more resilient to the risks of operating in space. The National Space Security Policy should be read in conjunction with the Civil Space Strategy. It sets out our space security needs and interests across Government and the need for close co-operation with our international partners, research organisations and industry.

Advances in technology are changing the economics of space and the Government intends the United Kingdom to be at the forefront of new opportunities as they emerge. Smaller and cheaper satellites and more innovative ways of using them will continue to bring new benefits, including directly to the British economy which has seen average annual growth of nine per cent in the space sector over the past decade. For the United

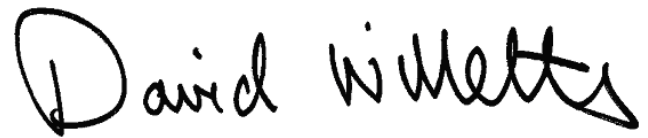
Kingdom, economic growth and security go hand in hand as mutually reinforcing principles.

The space sector is worth over £9 billion to the British economy every year and there is a clear ambition to raise this to £40 billion by 2030. Implementation of the National Space Security Policy is a key element of protecting and accelerating space enabled economic growth.

However, a growing national dependence on satellite services means that a co-ordinated approach is required to increase our resilience. Severe disruption to information received, transmitted or collected by satellites could pose a significant security and economic risk to the United Kingdom. Without satellites, distribution and transport systems would be slower and less responsive, bringing risk of delays, shortages and bottlenecks which would damage the wider economy. Our armed forces and security and emergency services would find co-ordinating and communicating with deployed personnel or emergency response vehicles much more difficult. Our ability to monitor, warn of, or react to threats as diverse as international humanitarian crises, volcanic eruptions, severe weather events, terrorist attacks, breaches of arms control agreements or expanding drug cultivation in remote and hostile areas would be seriously curtailed.

The Government already takes important steps to identify and manage risk more systematically and coherently, including a National Risk Assessment, which assesses the impact and likelihood of civil emergencies. The National Space Security Policy reinforces this by setting out how we intend to achieve continued access to space, mitigating the risks posed by state-sponsored and criminal interference with satellites, severe space weather events and the growing threat to satellite operations from space debris.

The industrial sector and national science base are key partners in building space security over the long term and in ensuring the United Kingdom's reputation for strong security awareness in an open business and research environment. This will enable us to play a leading role in European space security considerations. We also recognise that maintaining and enhancing co-operation with our international partners, in particular the United States, will be fundamental to our space security objectives and we will do this by maintaining capabilities and assets that bring mutual benefit to our space security relationship.




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Minister for Universities and Science



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Minister of State (Europe and NATO)



James Brokenshire MP
Minister for Immigration and Security

December 2013

Section 1: Executive summary

The aim of the National Space Security Policy is to set out a coherent approach to the United Kingdom's space security interests that will underpin our prosperity, well-being and security. We will meet the challenge through 4 objectives:

- To **make** the United Kingdom **more resilient** to the risk of disruption to space services and capabilities, including from space weather
- To **enhance** the United Kingdom's **national security** interests through space
- To **promote** a safe and more **secure space** environment
- To **enable industry** and **academia** to exploit science and grasp commercial opportunities in support of national space security interests

Main policy outcomes

In **making the United Kingdom more resilient to the risk of disruption to space services and capabilities, including from space weather**, we will:

- Improve our understanding of space security risks and dependencies
- Pursue a proportionate approach to investing in resilience, balancing protective

measures with other means of promoting resilience, such as alternative or fallback capabilities.

- Enhance the resilience of essential services (e.g. transport and communications) to the disruption of satellite operations, and the adverse effects of space weather
- Strengthen our ability to understand and forecast space weather events and their effects, and ensure a clearer focus for this work in Government.
- Work with the United States, European Union, Member States and European Space Agency on an integrated approach to security in European space programmes and wider space policy, including infrastructure and systems resilience. The United Kingdom will identify available national expertise to support these objectives.

In enhancing the United Kingdom's national security interests through space, we will:

- Ensure access to effective, reliable and efficient space capabilities to enable military and security operations, and further our international security policy interests.
- Meet these requirements by ourselves when a purely domestic responsibility or specific sovereign interest makes this necessary. However, our preference will be to work with others wherever we can.
- Sustain co-operation with the United States, as our pre-eminent national security partner, as a national space security priority. We shall maintain capabilities and assets which bring mutual benefit to this relationship.
- Take account of increasingly capable foreign counter-space programmes in meeting our security and defence requirements. Our response to any action through space, which might undermine our national security or impede freedom of action, will be consistent with our approach to any other threat.
- Monitor emerging systems and technologies and use the most appropriate, secure and cost-effective solution.
- Work closely with France, and other key European partners, on ensuring best practice in the security of European space programmes.
- Support work in the North Atlantic Treaty Organisation to identify its space related vulnerabilities and risks, and ways of

mitigating them.

- Ensure that the relevant national authorities have sufficient powers to prohibit the possession of jammers, and coherent advice and guidance in deciding how or whether to exercise these powers.

In promoting a safe and more secure space environment, we will:

- Support the United Nations in promoting a sustainable, safe, secure and peaceful space environment, including by contributing to work on space transparency and confidence-building measures.
- Work with international partners for the earliest and widest possible subscription to norms of responsible behaviour in space, through the proposed international Code of Conduct for Outer Space Activities.
- Support work in addressing the legal challenges associated with regulatory regimes relating to space.
- Support a coordinated international effort to improve space situational awareness.
- Develop a more coherent national approach to space situational awareness, as a better basis for co-operation with commercial and international partners.

In enabling industry and academia to exploit science and grasp commercial opportunities in support of national space security interests, we will:

- Work with industry and other Governments to ensure that British companies' reputation for sound space security is recognised and promoted widely, supporting the Government's agenda for growth through exports.
- Ensure that British companies and academic and research organisations continue to have a good understanding of potential threats and a clear regulatory framework, to allow them to grasp opportunities that are consistent with our national security interests.
- Ensure that export control policy considers the complex issues surrounding service provision agreements and data and imagery capture and transfer.
- Work with the United States to minimise the impact of US International Traffic in Arms Regulations (ITAR) on the growth of the space sector and on US-UK and wider allied interoperability.
- Promote broader links between experts in the commercial, civil and defence fields to sustain, build and share space security expertise.

Section 2: Context

Globally, space-based technology already underpins many aspects of our daily life and is becoming increasingly accessible to many more nations through improved launch technology and smaller and cheaper satellites. The United Kingdom is already embracing these developments as outlined in the Civil Space Strategy. But with growing economic opportunities, there are also risks which we need to understand better and for which we need to prepare. These risks could come in the form of accidents or natural hazards in space, or through threats such as a deliberate attack (by organised groups or another state). The National Security Strategy identifies “severe disruption to information received, transmitted or collected by satellites” as a significant security risk for the United Kingdom. The Strategic Defence and Security Review consequently called for a National Space Security Policy, to address both civil and military aspects of space security.

Aim

We define space security as having safe, assured and sustainable access to space capabilities, with adequate resilience against threats and hazards. Our aim in the National Space Security Policy is to set out a coherent national approach to the United Kingdom’s space security interests that will underpin our prosperity, well-being and security.

Section 3: The space environment

International law

The cornerstone of international space law is the 1967 Outer Space Treaty. It declares space to be the province of all mankind, free for exploration and use by all nations, and places international responsibility on the state for its national space activities, as well as liability on the launching state for any damage caused by space objects. The international legal framework has continued to develop, but space remains lightly regulated. The consequences of strategic or operational misunderstandings between states in space could be very grave. It is important that we achieve broad international agreement on sustainable, peaceful, safe and secure activities in space – just as we do at sea or in the air. The potential for different interpretations of some aspects of space law also exposes commercial and civil users - and the manufacturers, operators, service providers, underwriters or financiers who support them - to risks and uncertainties which may act as a barrier to progress. The United Kingdom supports efforts to reinforce the safety and security of the space environment, for states and other civil or commercial users.

Opportunity

Advances in satellite and launch technology are dramatically reducing the cost of access to

space. Commercial firms and public research organisations are identifying promising business ideas, bold new ways of providing cheaper, quicker and better data for public services and development, and opportunities to enhance our defence and security.

The Government sees space research, technology and services as important for Britain's economic growth and the National Space Security Policy seeks to support this objective, by identifying how our national prosperity and space security interests are aligned, and how they can be mutually reinforcing.

Dependence

With these opportunities has come a marked trend towards greater dependence on space-based capabilities to collect and transmit information by government, infrastructure, and public and commercial users.

Use of the Global Positioning System (GPS) is now so commonplace that some users are losing familiarity with traditional methods. Control centres for utilities, public services, or for highly efficient commercial distribution systems all make widespread use of satellite tracking and communications. Earth observation data is central to a number of requirements ranging from supporting emergency responses

Life-saver

The Ambulance Service relies extensively on GPS to minimise response times and make most efficient use of resources. Each ambulance is tracked through a control centre using GPS, allowing the control centre to identify the vehicle best-placed to respond to an incident. The ambulance crew uses GPS to guide them to the location of the incident and to make the swiftest hospital transfers. Thanks to satellite navigation and positioning systems, the Ambulance Service is saving more lives.

to disasters such as flooding to monitoring agricultural land use and fisheries. In some cases, it is needed to fulfil national or international statutory obligations such as the International Charter: Space and Major Disasters. The Defence sector is heavily reliant on communications, navigation and timing, and intelligence surveillance and reconnaissance capabilities provided by satellites, and without these, would find it more difficult to achieve the necessary level of situational awareness, timeliness and precision in operations. Government, the armed forces, security and emergency services, key infrastructure and satellite operators have carried out detailed analysis on space dependency resulting in increased resilience measures, including alternative techniques, additional redundancy in systems and other back-up plans. However, loss of space services would still prove very disruptive.

Risk

The growing economic and military significance of space means we must also be more aware of the associated risks. These risks take the form of malicious threats using **counter-space** technologies and non-malicious hazards. An assessment of the relative likelihood and impact of the risks to space services will be kept under review through the National Risk Assessment

Cyber interference

A report to the US Congress in 2011 found that hackers had been able to infiltrate and disrupt two US satellites on four occasions in 2007 and 2008. Landsat-7, a NASA Earth observation satellite, experienced interference in October 2007. The breach was only discovered following interference with another satellite, Terra-AM-1, in July 2008. The report for Congress concluded that, in interfering with Terra-AM-1, “the responsible party achieved all steps required to command the satellite.”

The hackers were assessed as likely to have been working for another state, gaining access through a Norwegian commercial ground station connected to the internet.

and the National Security Risk Assessment.

Cyber attack against commercial enterprises aimed at stealing technological expertise and other proprietary information is a growing risk to our ability to grasp opportunities in space; our policy for mitigating this risk needs to be consistent with the Government’s wider Cyber Security Strategy. Space systems, comprising the satellite, ground segment and communication links, are complex and can also be vulnerable to cyber attacks.

Signal interference through either **jamming** or **spoofing** is also becoming more common and can also be difficult to attribute. Some States have already shown that they can deny satellite communication signals during conflict. Broadcasters have also complained about increasingly frequent satellite uplink jamming; BBC broadcasts to Iran have been subject to regular disruption of this kind. Of equal concern is the relative ease with which signals from global navigation satellite systems, including GPS, can be interfered with. The received GPS signal is inherently weak, making it a target for criminals. Interference with the signal can also be indiscriminate, and an attempt to disrupt or disable one GPS-based system could at the same time disrupt unrelated systems.

Direct attacks against satellites are risky

and technically challenging, with only a few states having the capability. Anti-satellite missiles have been tested successfully against satellites in low earth orbit, but they can have unintended and indiscriminate consequences through the creation of debris. Interference directly from another satellite could cause as much damage as a missile, and may be harder to attribute or even distinguish from a natural event. Geostationary earth orbit (GEO), some 36,000km from Earth, contains a number of high value satellites in relative close proximity, especially communications satellites. Tracking objects in GEO is difficult, so mitigating a risk to these satellites is particularly challenging.

Space weather effects are primarily the result of solar eruptions. They can damage satellite systems and penetrate or interact with the Earth's magnetic field. Space weather events can have unpredictable and widespread effects, including secondary impacts on both satellite and ground infrastructure.

We have increased our understanding over recent years of an extreme space weather event, such as the "Carrington event"¹ of 1859. Today, this type of event would be likely to disrupt satellite signals and operations temporarily - and in extreme cases permanently - due to the satellite being exposed to elevated levels of radiation and energetic particle effects. Extreme space weather could also disrupt ground support for space activities, as well as the power networks, communications and aviation.

The immediate economic and social disruption could be significant due to the effects of localised electrical power cuts and the potential slow recovery of infrastructure; for example, power transformers can take several months to replace if they are severely damaged. Less-severe space weather events can also pose a risk, with one geomagnetic storm in 2003 causing the GPS navigational guidance system used by aircraft to be degraded for 30 hours. The Government includes an assessment of the likelihood and impact of a Carrington-magnitude event in its classified National Risk Assessment, and publicly available National Risk Register².

The number of earth-orbiting objects is growing fast. There are some 22,000 objects currently tracked in Earth orbit, but only 5% of these are operational satellites. The remainder are items of **space debris**. The total amount of debris, most of which is too small to be detected, is estimated to be in the region of several million objects. The amount of debris in orbit today is twice that in 1990, and there has been a 30% increase since 2007.

Most space debris is generated by objects breaking up before re-entering the atmosphere, accidental collision of space objects or by the deliberate destruction of satellites. Growth in the amount of debris increases the probability of further collision, and thus risks to space activity. The costs associated with more frequent manoeuvring of satellites to avoid the debris, including increased fuel usage and shortened operational life, introduce an economic burden on space users.

¹ The largest recorded space weather event happened in 1859, and is known as the "Carrington event". The potential impact of an event is set out in more detail in the Royal Academy of Engineering report "Extreme space weather: impacts on engineered systems and infrastructure" published in February 2013.

² <https://www.gov.uk/government/publications/national-risk-register-for-civil-emergencies-2013-edition>

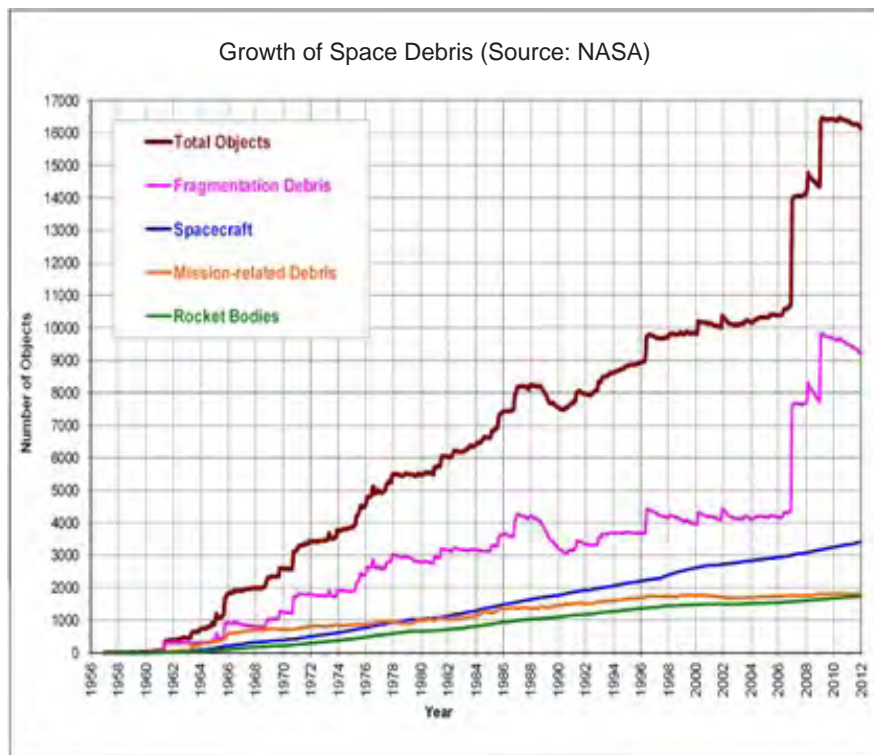


Fig 1. The number of objects in Earth orbit officially catalogued by the US Space Surveillance Network. These include only those objects whose origin has been identified. The sharp increases in debris in 2007 and 2009 were caused, respectively, by China's destruction of a defunct satellite with an anti-satellite weapon, and by a collision between a US and Russian satellite. Source: NASA Orbital debris Quarterly, January 2012.

Section 4: Policy response

We will address the risks associated with our national dependence on space through four objectives. This approach will require enhanced coherence across Government and in our co-operation with partners and allies.

To **make** the United Kingdom **more resilient** to risks to space services and capabilities, including from space weather

To **enhance** the United Kingdom's **national security** interests through space

To **promote** a safe and more **secure space** environment

To **enable industry** and **academia** to exploit science and grasp commercial opportunities in support of our national space security

Objective 1

To make the United Kingdom more resilient to risks to space services and capabilities, including from space weather.

This will be achieved by increasing the resilience of space services to disruption from malicious (e.g. jamming) or natural (e.g. space weather) causes, and by reducing the vulnerability of essential infrastructure (e.g. transport and communications) to disruption to space services, or direct disruption caused by space weather. In both cases we need a proportionate approach to investing in resilience, balancing protective measures, such as encryption, hardening and resistance to jamming, with other means of promoting resilience, such as improved forecasting, alternative or fallback capabilities. Responsibility will rest largely with owners and operators of space services or with infrastructure owners and operators, with oversight provided by lead Government departments.

An improved understanding of our space security risks and dependencies across public and commercial sectors will allow the United Kingdom to build the right level of resilience for space capabilities and services. It will also enable businesses, infrastructure sectors and other public and private sector bodies to exercise their responsibility to ensure that space resilience and space security considerations are incorporated in resilience, business continuity and security plans. This will better prepare us to operate in an environment with reduced access to space data and capabilities.

Resilience can be enhanced through good partnership and information-sharing, without the need for direct intervention by government in areas that are the responsibility of infrastructure owners and operators. Resilience often comes through a balanced mix of redundancy and other measures. It may, for example, be necessary to better protect some critical equipment against the potential effects of space weather, while also examining alternative capabilities which would not be affected by the loss of space-derived services and data. Encouraging further private sector engagement and partnership for space security and resilience technology, it may be possible to leverage more commercial investment and reap efficiencies. Greater coordination will enhance the Government's ability to take a coherent approach in identifying common space security and resilience measures which benefit several sectors.

Alternative navigation methods

The enhanced Long Range Navigation system (e-LORAN), being developed and established by several countries as a terrestrial alternative to global navigation satellite systems for mariners, might be developed further in ways which could bring resilience benefits to other, non-maritime sectors.

Although space weather effects may be unavoidable and, to some extent, unpredictable, there is scope to prepare for some of the larger effects and implement contingency plans. Alongside expert groups and research councils, the Government is taking action to better understand space weather and its effects and how these might be mitigated. Cross-Government work is already in place to build the United Kingdom's resilience to an extreme

space weather event, collaborating with external experts, local emergency responders and international partners as appropriate. As well as improving the United Kingdom's national resilience, the Government is also contributing to global efforts.

Cooperation between the Met Office and US National Oceanic and Atmospheric Administration is enabling the creation of a permanent space weather forecasting capability in the United Kingdom and on-going collaboration in the adoption of space weather models to improve prediction of where, when and for how long space weather effects might persist. In addition to our work on resilience with the United States, the United Kingdom is actively working with European partners to maintain and improve our observational capability, increase our understanding of space weather and its effects, and to develop improved forecast models. The United Kingdom has invested in the space weather element of the European Space Agency's Space Situational Awareness programme and continues to support European Space Agency space weather missions. British researchers have now also taken leading roles in European Union research projects.

Through the European Space Agency, and with the identification of space as an area of shared competence with Member States under the Lisbon Treaty, the European Union has important space interests.

It is in the security interest of the United Kingdom to work with the European Commission, European Space Agency and

Member States to ensure, as far as possible, the resilience and security of developmental space systems, their technology, intellectual property and the integrity of service to potential British and European public users. We welcome recent progress in these areas, including against the threat of state-sponsored data theft, compromise and cyber-attack. The United Kingdom will therefore work closely with European Union Member States, the Commission and European Space Agency partners to reinforce and develop an integrated approach to wider space policy, including in infrastructure resilience and security. We will continue to seek leadership roles where appropriate and identify available national expertise to reinforce resilience and security in European space programmes.

Objective 2

To enhance the United Kingdom's national security interests through space

Space capabilities greatly enhance our ability to conduct military operations, further our international security policy interests and monitor development and disaster relief activity around the world. We shall continue to ensure we have the most effective, reliable and efficient means of delivering these capabilities.

The United Kingdom's pre-eminent security relationship is with the United States of America; it remains fundamental to our defence and security at home, in Europe and around the world. Security, defence and intelligence co-operation with the United States is exceptionally close, and our work together in and through space is an essential part of

this. This co-operation helps deliver vital capabilities which warn of emerging threats, contribute to our ability to prevent or deter them, enhance our ability to act in direct response to them, and provide means for monitoring and verification of Treaties and other international agreements. Much of it uses data integrated from a range of space-based reconnaissance and navigation systems, passed across satellite communications systems.

The United Kingdom will sustain this co-operation with the United States as a national space security priority. We will maintain capabilities and assets which bring mutual benefit, through our investment in research and technology, high-calibre expertise and facilities on British territory for which we have joint responsibility, such as RAF Fylingdales.

RAF Fylingdales

The United Kingdom contributes to the US Space Surveillance Network through operation of the Ballistic Missile Early Warning System at RAF Fylingdales in North Yorkshire. The solid state phased array radar can track hundreds of objects per minute, through low Earth orbit, to a range of 3,000 nautical miles, providing a missile warning and space surveillance service for the British and US Governments.

We will ensure that our approach to security and defence takes account of increasingly capable foreign counter-space programmes. Our response to any space threat will be consistent with our approach to any other threat. We will continue to draw on a range of options available to Government, in close consultation with our Allies and in accordance with our obligations under international law.

The United Kingdom needs to protect our most sensitive national information and assets, but our preference will be to co-operate with Allies and partners wherever possible.³ A purely national solution may be essential in a few cases, but it is often possible to ensure the integrity of our national security interests through safeguards with industry and Allies. In its approach, the United Kingdom will need to strike a balance between sovereign control and the opportunities and advantages offered through co-operation.

European Union space programmes are civil in gestation, but have dual military and civil application in practice, as demonstrated by the development of a more secure “public regulated service” for the European Union’s Galileo global navigation system.

While recognising the importance of maintaining the civil nature of European Union space programmes, the United Kingdom will continue to monitor emerging systems and technologies and use the most appropriate, secure and cost effective solutions, which may in future include dual-signal global navigation satellite system receivers.

The United Kingdom maintains that good security should be integral to European space programme governance and should not be treated as discretionary. The United Kingdom will continue to work closely with France, and other key European partners, on issues relating to the security of European space programmes.

³ Sovereign considerations include: national control of research and development, location, operation, and protection of data.

We will also continue to explore wider options to co-operate with close Allies and partners in the space security field, including under the Franco-British Defence and Security Co-operation Treaty.

The North Atlantic Treaty Organisation has an important role in building Alliance-wide recognition of the security risks and opportunities in space, and in ensuring that Allies' plans, training, requirements and doctrine are consistent with this. The North Atlantic Treaty Organisation's Strategic Concept warns of trends which could impede access to space and therefore affect North Atlantic Treaty Organisation military planning and operations. The United Kingdom will support work in the North Atlantic Treaty Organisation to identify space related vulnerabilities and risks, and ways of mitigating them, in the interests of a resilient Alliance capable of working effectively in a degraded space environment.

Deliberate radio-frequency interference, including the jamming or spoofing of global navigation satellite system signals, often has secondary and unintended consequences that we need to ensure adequate measures and protection against. We will ensure that the relevant authorities have sufficient powers to prohibit the possession of jammers, and coherent advice and guidance in deciding how or whether to exercise these powers.

Objective 3

To promote a safe and more secure space environment

The United Kingdom's own obligations under the Outer Space Treaties and Principles are enshrined in law through the Outer Space Act. The United Kingdom also welcomes freedom of access to space by all nations, subject to compliance with international law. The United Kingdom continues to play a central role in promoting a sustainable, safe, secure and peaceful space environment – for example, through the active engagement of leading United Kingdom experts working with the United Nations Committee on the Peaceful Use of Outer Space (COPUOS). All nations stand to gain from strengthening the integrity of the international system and promoting sustainability and global public good. The United Kingdom therefore supports dialogue between all major space faring nations about the way in which they define their strategic interests in space, and to this end, the United Kingdom continues to play a key role in the deliberations of the United Nations Group of Governmental Experts.

Difficulties in reaching international consensus on aspects of existing space treaties has led to the need for complementary efforts to agree non-legally binding principles for responsible behaviour in space. The most notable of these is the European Union's initiative to advance an Code of Conduct on Outer Space Activities.

The Code of Conduct can strengthen transparency and predictability in space activity through wide international agreement to a

set of principles guiding behaviour in space; for example, this would benefit all users in minimising the risk posed by space debris. In pursuing the Code, it is recognised that most activity in space can have dual military and civil use, but does not seek to define civil or military applications or to prejudge issues before the Conference on Disarmament. The United Kingdom will continue to work through the European Union, with fellow Member States and with the broadest possible range of partners for the earliest and widest possible international agreement to a set of principles guiding behaviour in space, recognising that the Code of Conduct is the best approach for achieving this. We also recognise that the Code needs to remain responsive to the new challenges which will emerge from such a dynamic space environment.

The transnational nature of operations in space makes issues of ownership, control, responsibility, authority and liability difficult to determine. The development and clarification of international regulatory regimes to deal with these issues remains an important objective for the United Kingdom. British legal and space experts are playing a prominent role in work to address these legal challenges.

As space becomes more congested, there is a growing need in the United Kingdom and other countries for a more holistic space situational awareness picture and more predictive capabilities. This involves the surveillance of space⁴, and the analysis and assessment of potential threats and hazards to

space activities. Although removing debris is technically possible, mitigation is complicated by cost, legal and political problems⁵. Space situational awareness provides the ability to anticipate and respond to these threats and hazards, including space weather and the growing amount of space debris, in a timely manner, thus reinforcing resilience, and national and international security. Space situational awareness is one of the means by which we fulfil our obligations under the 1986 Outer Space Act, in monitoring objects licensed for launch by the United Kingdom. It also allows us to apply best practice and warn of potential collisions or radio frequency interference. The United Kingdom is also promoting standards for the manufacture, deployment and operation of satellites.

The United States maintains the strongest national space situational awareness capability through its space surveillance network, to which the United Kingdom contributes through RAF Fylingdales, with national coordination through the Space Operations Coordination Centre at RAF High Wycombe.

This arrangement gives the United Kingdom access to much better space situational awareness than we could achieve alone, but it still does not meet all of our national needs, or those of United Kingdom-based commercial or civil operators.

We recognise that generating space situational awareness to support a safer and more secure space environment is best achieved collectively and the United Kingdom welcomes the initiative

⁴ Comprising the detection, tracking, identification, analysis and cataloguing of space objects including satellites, missiles, debris and near Earth objects.

⁵ The laws of salvage of the ocean do not apply to space. An effort by one country to remove a non-functioning object owned by another country could be interpreted as interference and raise wider security concerns.

in the United States National Security Space Strategy for broadening space security co-operation with international and commercial space-faring partners, including in this key area.

The United Kingdom needs to play its part in this collective effort to improve shared space situational awareness, and is therefore considering ways in which it might contribute to United States, as well as European and other initiatives. This will require greater focus in the United Kingdom's approach across the defence and civil sectors. To meet this requirement, the United Kingdom will develop a coherent national approach to space situational awareness, as a basis for a stronger British contribution to international and commercial co-operation.

Satellite services depend on the assignment of radio spectrum to enable both the uplink of services and the downlink of communications. Along with the allocation of orbital slots, these assignments are managed by the International Telecommunications Union (ITU), although it is the responsibility of national regulatory authorities to ensure that the spectrum is kept clear of interference.

The United Kingdom will continue to engage with the International Telecommunications Union to secure and protect any assignments to satellites serving the United Kingdom's national security and resilience.

Objective 4

To enable industry and academia to exploit science and grasp commercial opportunities in support of national space security interests

Within a rapidly expanding and competitive global space marketplace, the United Kingdom's science and commercial space sector shows great innovation and promise for further growth. It is open to the world, relying far less on national government support and contracts than counterparts in any other large economy. British universities, research bodies and companies are leaders in a range of specialist fields, from small satellites to space applications. British companies and academic and research institutions therefore continue to need a good understanding of potential threats and a clear regulatory framework, to allow them to grasp international opportunities in ways which support, or are at least not harmful to, our national security interests.

In maximising export opportunities with full regard for security interests, we shall ensure that export control policy considers the complex issues surrounding service provision agreements and data and imagery transfer. However, within that framework individual licensing decisions will continue to be made on a case-by-case basis in the light of that policy and consistent with the United Kingdom's European Union and wider international obligations and commitments. The technology used in civil and military space is often common to both, making most technology 'dual use'. While this can create a wider market

and reduce the cost of such development for space security applications, it can also make it more difficult to control the proliferation of technology. A balance must be struck; we will encourage the development of technology with wider applications that is consistent with our space security objectives.

The United Kingdom contributes significant resources to European space efforts through the European Commission and programmes managed by the European Space Agency. These programmes have delivered a good level of industrial return through identifying commercial opportunities for British industry. Our potential for grasping these opportunities will be enhanced by a credible approach to space security. Specifically, a strong, integrated approach to security in European space policy and programmes can bring valuable return to the commercial space sector and ensure confidence in Europe's space security credentials.

The United States is also an important industrial, research and acquisition partner. We will continue our efforts to improve collaboration and interoperability with the United States, including in new technologies and applications which can benefit our mutual space security interests. However, the United States International Traffic in Arms Regulations (ITAR) can sometimes complicate trade in space components and systems, as well as greater industrial and research co-operation.

We will continue to work with the United States to minimise the consequent impact on United States-United Kingdom and wider Allied

interoperability and the impact on economic growth in the space sector.

Not all markets across the world are equally accessible to British industry. We will work with industry and other Governments to ensure that British companies' reputation for sound space security awareness is high and that, as far as possible, there are no unjustified barriers to British companies competing or teaming with foreign companies in the space security market. The United Kingdom should be seen as a safe and secure place from which to procure and operate space systems that are adequately resilient to space threats and hazards.

British companies and research organisations are at the forefront in important areas of space-related manufacturing, research and technology. Their expertise can underpin space security capabilities, given the close link between technological change and the evolution of security risks.

To maintain this leading edge we will promote broader links between experts in the commercial, civil and defence fields, to sustain, build and share space security expertise.

Section 5: Implementation

The aim of the National Space Security Policy is to set out a coherent national approach to the United Kingdom's space security interests that will underpin our prosperity, well-being and security. We have four objectives in meeting this aim, the approach to which is informed by dynamic opportunities and risks.

Success in implementing this Policy will depend on our ability to achieve a truly coherent approach across Government and will be demonstrated by the emergence of initiatives serving multiple and mutually reinforcing space security interests. Our international partners, along with those in science and industry will be a crucial resource in helping to make this happen.