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By,
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The militarisation of space

Summary

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Contents

Summary

Space has been used for military purposes for decades, albeit limited to the deployment of non-offensive military systems such as communications, navigation, imaging and surveillance satellites. Several countries, including the UK have developed a comprehensive space-based military architecture to facilitate military activities on the ground.

However, space is becoming an increasingly contested environment. The last few years has seen a proliferation in the number and type of actors operating in space, and a growing interdependence between the military, civil and commercial space sectors.

Protecting critical space-based assets, both civilian and military, has therefore become a priority. Space is also increasingly viewed as a military domain in its own right, as countries look to utilise space to enhance their own military capabilities and security.

In the last few years there has been considerable investment by several states, most notably Russia and China, in offensive counterspace capabilities that potentially threaten the use of space by the UK and its allies. The US has responded by calling for a rapid increase in the development of counterspace capability and the adoption of more aggressive space policies and postures.

Combined with the lack of regulation and accepted international norms of responsible conduct in space, and little appetite to advance that agenda, this more overt behaviour among nations is fuelling fears of a new arms race.

This briefing paper examines how the militarisation of space is evolving into the weaponisation of space and what role the UK envisages for itself going forward. It does not address civilian or commercial space programmes or the synergy between them and the military sphere.

The UK's civil space sector is examined in more detail in The UK Space Industry, House of Commons Library, April 2021.

1 Space as a new military frontier

Why is space important?

Space plays an intrinsic role in nearly every aspect of modern-day life from underpinning the global economy, to communications, navigation, entertainment and environmental monitoring.

Space is also critical to the conduct of military operations and the provision of national security.

Space has been used for military purposes for decades, albeit limited to the deployment of non-offensive military systems such as communications, tracking, imagery, positioning, navigation and surveillance satellites. Several countries, including the UK through its Skynet satellite communications system, have developed a comprehensive space-based military architecture to facilitate military activities on the ground.

As such, it is generally accepted that the militarisation of space has long been a reality.

However, space is becoming an increasingly contested environment.[1] The last few years has seen a proliferation in the number and type of actors operating in space, and a growing interdependence between the military, civil and commercial space sectors.[2]

As the Secure World Foundation has noted:

> The space domain is undergoing a significant set of changes. A growing number of countries and commercial actors are getting involved in space, resulting in more innovation and benefits on earth, but also more congestion and competition in space.[3]

Protecting critical space-based assets, both civilian and military, has therefore become a priority. Space is also increasingly viewed as a military domain in its own right, as countries look to utilise space to enhance their own military capabilities and security.[4]

In the last few years there has been considerable investment by several states, most notably Russia and China, in offensive counterspace capabilities that potentially threaten the use of space by the UK and its allies. Several analysts have also raised concerns over the potential for conflict to spill over into this new domain, and the threat that non-state actors may pose.

The militarisation of space is thus evolving into the weaponisation of space.

1 Space is part of the global commons and the concept of territorial sovereignty does not apply in space (*Outer Space Treaty 1967).*

2 Space-based capabilities are inherently dual-use in nature. The same environment, largely the same technologies, and often the same infrastructure is used for both military and civilian/commercial purposes.

3 Global counterspace capabilities, Secure World Foundation, April 2021, p.vi

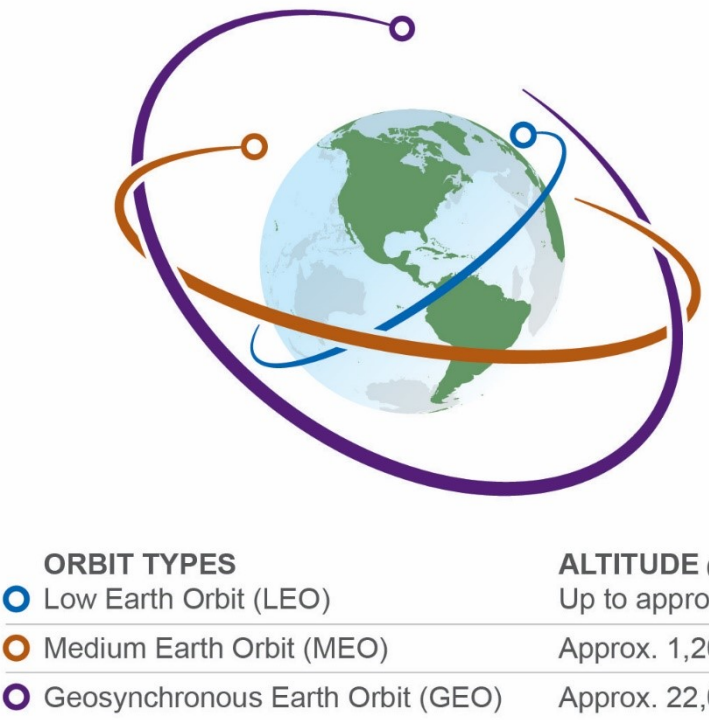
4 Russia designated space as a warfighting domain in its 2014 Military Doctrine. China's Defence White Paper in 2015 followed suit. In November 2019 NATO designated space as a military domain.

2 Where are military assets in space?

The latest data published by the Union of Concerned Scientists estimates that there are 3,372 satellites in space, across the whole spectrum. An estimated 77 per cent (2,612) are in low earth orbit (LEO). A further 16.6 per cent (562) are in geosynchronous earth orbit, also referred to as geostationary orbit (GEO) and 4 per cent (139) are in medium earth orbit (MEO).

93 per cent of all satellites operate in either low earth orbit (LEO) or geosynchronous orbit (GEO)

Picture 1 Typical satellite orbits



US Army Acquisition Support Center

Of the total number of satellites, 15.5 per cent (516) have military or dual-use purposes.

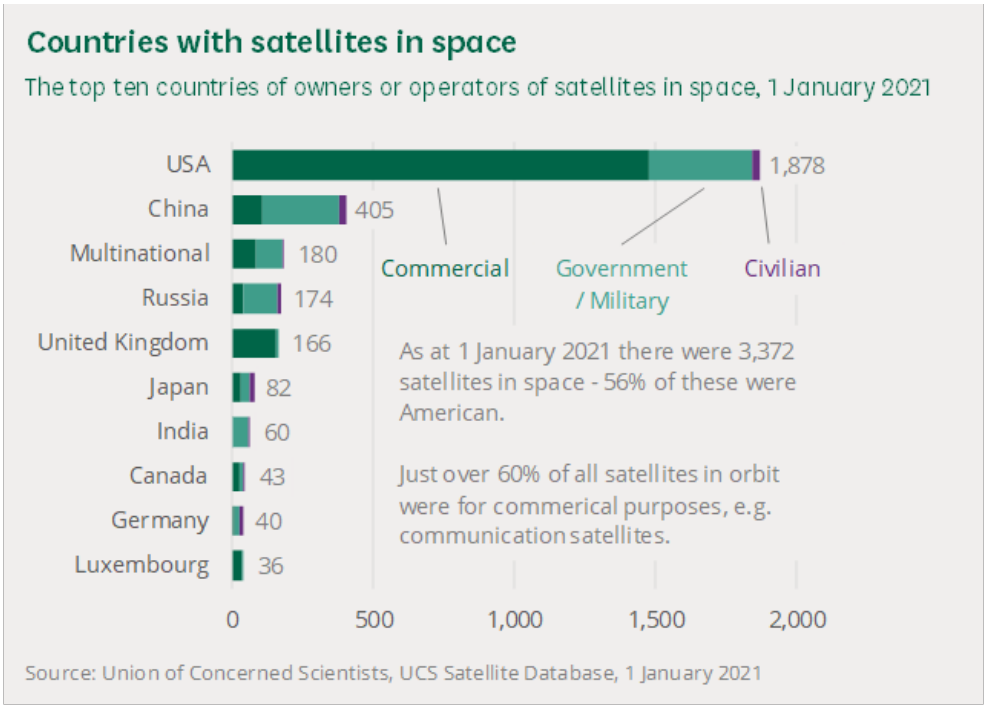
Just over half of those (265) are in low earth orbit. The combination of low altitude and a short orbital period[5] makes LEO military satellites ideal for earth observation, imaging, surveillance and reconnaissance.

[5] Satellites in low earth orbit typically take between 90 minutes and two hours to complete one full orbit around the earth.

Communications satellites in LEO are often deployed as part of a large network of multiple satellites in order to provide constant coverage.

A quarter of military satellites (132) are in geosynchronous earth orbit.[6] Satellites in this orbit observe the earth as if it was not rotating, making them ideal for weather monitoring, intelligence observation, and communications systems such as the UK's Skynet system.[7] Many classified military satellites are in GEO.

A further 94 military satellites are in medium earth orbit. Satellites in MEO have a larger geographical footprint than LEO satellites and shorter transmission times than a GEO satellite making this orbital path useful for navigation systems. The US' Navstar GPS system, Russia's GLONASS system, China's Beidou system[8] and the EU's Galileo all operate in this orbit.



[6] Satellites in geosynchronous orbit take one day to complete a full orbit of the earth.

[7] A GEO satellite covers approximately one third of the earth's surface. Three equally spaced GEO satellites can therefore provide near global coverage.

[8] A number of Chinese satellites in the Beidou system are also in GEO (Union of Concerned Scientists, UCS Satellite Database)

3 What are counterspace capabilities?

There is no universally agreed definition of a "space weapon" or what constitutes the weaponisation of space.

It is generally accepted that counterspace capabilities are those which can be used to disrupt, deny, degrade or destroy space-based systems. Those capabilities could be kinetic in nature (involving a direct physical strike on a space asset or physical interference with an object to move it out of a stable orbit) or non-kinetic (having an effect on a target without actual physical contact). They could also be capabilities that disrupt an assets ability to transmit and receive through jamming or spoofing (electronic), or cyber based, which target space systems through their data and software.

These capabilities could also be ground launched (earth-to-space), or space based (space-to-space). Within the discussion of "space weapons" analysts have also increasingly focused on the longer-term possibility of space-based assets capable of striking targets on earth (space-to-earth).

Todd Harrison of the Center for Strategic and International Studies has defined such capabilities thus:

> Using a broad view of space weapons, something could be considered a space weapon if it either originates in space or has effects in space. Weapons that originate on Earth and have effects on Earth are generally not considered space weapons even if they transit through space, such as intercontinental ballistic missiles. Space systems that are merely used for passive support to other forces, such as communications, PNT [position, navigation and timing], or intelligence collection, are also generally not considered to be space weapons.
>
> A space weapon is used to apply force directly against an adversary (force application) or to directly interfere with an adversary's ability to conduct military operations in, through, or enabled by space (space control).[9]

Counterspace capabilities are diverse, capable of being used either in a one-off attack, or as part of a widening existing conflict. And as US General David Thompson noted in evidence to the Senate Armed Services Committee in May

[9] Todd Harrison, International perspectives on space weapons, Center for Strategic and International Studies, May 2020, p.5

2021 "the single greatest challenge lies in the need to counter all of them at once".[10] Such capabilities include:

- Direct ascent anti-satellite (ASAT) missile (earth-to-space) – capable of targeting satellites in low earth orbit, and potentially medium earth orbit if the range is great enough.[11] GEO satellites are not considered susceptible to direct ascent ASAT due to the distance they would have to travel.[12]
- Co-orbital anti-satellite (ASAT) weapons (space-to-space).
- Ground or space-based directed energy weapons (lasers, microwave, electromagnetic pulse).
- Cyber attacks against satellites and associated ground-based infrastructure or electronic warfare such as uplink satellite jamming.

The creation of space debris and space weather is also an ever-present danger to existing manned and unmanned space-based assets.

With the exception of ASAT weapons, which are easily attributable to a specific actor, the majority of these capabilities are largely asymmetric in nature and allow a certain degree of deniability.

In the longer term, the deployment of space-based missile interceptors or global strike capabilities designed to target locations on earth are acknowledged as a possibility.

As Martin Faga, Former Assistant Secretary of the US Air Force for Space and Director of the US National Reconnaissance Office, has observed:

> The situation we confront today was inevitable. Capability is always met with counter-capability.[13]

[10] Statement of General David Thompson, Vice Chief of Space Operations, to the Senate Subcommittee on Strategic Forces, 26 May 2021

[11] Several missile defence and long-range/ intercontinental ballistic missile systems are considered Low earth orbit ASAT capable. ICBM, for example, enter low earth orbit, before re-entering the earth's atmosphere.

[12] The maximum range of any existing ICBM is approximately 15,000km.

[13] Space Threat Assessment 2020, Center for Strategic and International Studies, foreword

4 The regulation of space

Most general customary rules of international law apply in space. The UN General Assembly adopted Resolution 1721 (XVI) in 1961, which stated two general principles:

- International law, including the Charter of the United Nations, applies to outer space and celestial bodies;
- Outer space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation.

Nothing in international law currently prohibits the deployment of weapons, with the exception of WMD, in space, or the deployment of ground-based counterspace capabilities.

This was later reiterated in Articles 2 and 3 the Outer Space Treaty:[14]

> ARTICLE II: Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.
>
> ARTICLE III: States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international co-operation and understanding.

4.1 Use of military force in space

In terms of the militarisation of space, these principles mean that any customary international law principles that apply to the use of force and use of weapons on Earth would also apply in space, including the general prohibition of force in international law (in Article 2(4) of the UN Charter) and principles of international humanitarian law.

However, while these principles may prevent unprovoked or illegal military action from space, or in space, between states, they do not provide for the complete demilitarisation of space altogether. The right of self-defence in Article 51 of the UN Charter may well apply in space too.

[14] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, (adopted 27 January 1967, entered into force 10 October 1967), in UN General Assembly Resolution 2222 (XXI).

4.2 Deployment of weapons in space

There are also regulations for space law concerning militarisation of specific parts of space and the use of specific weapons.

For example, Article IV of the Outer Space Treaty provides that the moon and other celestial bodies shall only be used exclusively for peaceful purposes:

> The moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the moon and other celestial bodies shall also not be prohibited.

The treaty does not define what is meant by 'peaceful purposes'. This was clarified in part by Article III of the 1979 Moon Agreement,[15] which prohibits threats or uses of force on the moon, and the placing of nuclear weapons in orbit around the moon:

> 1. The moon shall be used by all States Parties exclusively for peaceful purposes.
>
> 2. Any threat or use of force or any other hostile act or threat of hostile act on the moon is prohibited. It is likewise prohibited to use the moon in order to commit any such act or to engage in any such threat in relation to the earth, the moon, spacecraft, the personnel of spacecraft or man- made space objects.
>
> 3. States Parties shall not place in orbit around or other trajectory to or around the moon objects carrying nuclear weapons or any other kinds of weapons of mass destruction or place or use such weapons on or in the moon.
>
> 4. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on the moon shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration and use of the moon shall also not be prohibited.

[15] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, (adopted 5 December 1979, entered into force 11 July 1984) in UN General Assembly Resolution 34/68.

However, there are only 18 parties to the Moon Agreement, and these notably exclude the UK, the US, Russia, and China.

But when it comes to placing weapons or military equipment into orbit around the earth, the restrictions on militarisation are limited. Article IV of the Outer Space Treaty Provides:

> States Parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.

This means that currently only nuclear weapons or weapons of mass destruction must not be placed into orbit around the earth. Space law still covers the general prohibition on the use of force from satellites in orbit, but it does not prohibit the placing of other weapons and military equipment into orbit.

Nothing in space law also prevents the use of ground-based counterspace capabilities such as direct ascent ASAT missiles or non-kinetic capabilities.

4.3 What support is there for greater regulation?

Existing international law is considered to be lacking when it comes to space as a military domain. Critics argue that it no longer reflects technological capability in space and does not provide for any accepted international norms of responsible behaviour amidst an exponential rise in the number of actors in space from across the military/civil/commercial spectrum.

The push for greater regulation and a code of behavioural conduct has therefore been rising up the agenda as an increasing number of states seek to exert their influence in this new military domain.

Achieving a consensus on regulation, however, will not be easy. The world's leading space powers have their own interpretation of what regulation should look like and what it should achieve. As many analysts have noted, there is a perceived preference, on all sides, for regulation that promotes freedom of their own action, while curtailing the activities and aspirations of others. Support for arms control in space is often seen as contradictory to the actions and rhetoric of the leading states.

The US has been particularly vocal in the last few years on the need for established behavioural norms in space, in response to what it views as Russia's destablising actions (see below). One of the US' stated objectives in its Defense Space Strategy 2020 is to "uphold internationally accepted standards of responsible behaviour as a good steward of space…" and to "align with allies and partners to develop and promote standards and norms of appropriate behaviour in space to reduce the potential for miscalculations". In December 2020 the US voted in favour of a UN General

Assembly Resolution (A/RES/75/36), initially introduced by the UK, calling for action Reducing space threats through norms, rules and principles of responsible behaviours.

However, in contrast, the US has consistently voted against any UN resolutions aimed at preventing an arms race in outer space (PAROS) via a more formal treaty mechanism. Parallel resolutions introduced in the UN General Assembly in 2020 preventing an arms race in outer space (A/RES/75/35), no first placement of weapons in outer space (A/RES/35/37) and increased transparency and confidence building measures in outer space activities (A/RES/35/69) were voted against by the US.[16]

In contrast, both Russia and China voted against resolution 75/36 establishing norms of behaviour but voted in favour of resolutions 75/35, 75/37 and 75/69. Their formal support for a treaty on prohibiting the weaponisation of space is longstanding. In 2008 Russia and China presented a draft treaty to the Conference on Disarmament on the Prevention of the Placement of weapons in Outer Space (PPWT), a move which the US dismissed at the time as "a diplomatic ploy"[17] and criticised for its lack of verification measures, its definition of a space weapon and the exclusion of ground-based ASAT weapons. In 2014 Russia and China submitted an updated draft of that treaty which acknowledged the need for verification measures but suggested could be included in a subsequent protocol to the treaty.

Both countries have often been criticised for their longstanding formal support for arms control in space, while at the same time engaging in a build-up of counterspace forces, including ASAT capabilities, and what is widely viewed as provocative and destabilising behaviour (see below).[18]

1 Suggested reading

- "Enhancing space security: time for legally binding measures", Arms Control Today, December 2020
- "Diluted disarmament in space: towards a culture for responsible behaviour", SIPRI, November 2020
- Space: an emerging domain of conflict?, International Institute for International Studies, July 2020
- Todd Harrison, International perspectives on space weapons, Center for Strategic and International Studies, May 2020

[16] The US also voted against

[17] Nuclear Threat Initiative, Proposed Prevention of an Arms Race in Outer Space (PAROS) treaty, April 2021

[18] See, for example, "Russia's beahviour risks weaponizing outer space", Chatham House Expert Commentary, 27 July 2020

5 Who is leading the way on counterspace capabilities?

"Space is for all but there is a risk that it is being hijacked by a few".

Dr Beyza Unal and Mathieu Boulègue, Chatham House, July 2020

The United States and the Soviet Union have been experimenting with offensive space capabilities since the early years of the Cold War.[19] It is only in the last 10-15 years, however, that the use of space and the development of these capabilities has proliferated to such an extent that the vulnerability of critical space-based assets and the potential for space as a warfighting domain have risen up the national security agenda.

Calls have been made, in several countries, for a rapid increase in the development of counterspace capability and the adoption of more aggressive space policies and postures. Combined with the lack of regulation and accepted international norms of responsible conduct in space, this more overt behaviour among nations is fuelling fears of a new arms race.

5.1 United States

The United States is the world's predominant space actor.

Since the early 1960s the US has been "militarising" space. Research and development on offensive counterspace capabilities was initially limited in scope, however, and designed to counter a specific threat from the Soviet Union. In the 1980s space-based interceptors and lasers became a key part of the conceptual architecture of President Reagan's missile defence programme: the Strategic Defence Initiative, or what was dubbed "star wars". After the collapse of the Soviet Union and the end of the Cold War, the SDI programme was officially ended in 1993.

However, the idea of weaponising space was revisited several times and in 1997 US Air Force Space Command published a document entitled Vision for 2020, which promoted space weaponisation as a means of protecting the US' space-based assets. In 2001 the report of the Commission to Assess United States National Security Space Management and Organization, also acknowledged:

> An attack on elements of U.S. space systems during a crisis or conflict should not be considered an improbable act. If the U.S. is to avoid a "Space Pearl Harbor" it needs to take seriously the possibility of an attack on U.S. space systems. The nation's leaders must assure

[19] US and Soviet efforts in the Cold War are discussed in Space Threat Assessment 2020, Center for Strategic and International Studies and in "As Russia stalks US satellites, a space arms race may be heating up", Bulletin of the Atomic Scientists, 22 May 2020

> that the vulnerability of the United States is reduced and that the consequences of a surprise attack on U.S. space assets are limited in their effects.[20]

Achievement of full spectrum dominance in space has thus been supported by every subsequent US administration.

Over the last 20 years the United States has been conducting research and development across all elements of space. With respect to offensive counterspace capabilities, that research has focused on both kinetic and non-kinetic anti-satellite (ASAT) capabilities, directed energy weapons and electronic warfare. The potential role of space-based interceptors has also been re-examined several times as part of revised missile defence plans,[21] and in the early 00s, studies were also conducted into the potential deployment of conventional prompt global strike capabilities in space.

Operational counterspace capability

The US has the most extensive situational awareness capability among all nations in space, largely as a result of the significant infrastructure developed for missile warning and missile defence during the Cold War. At its core is a geographically dispersed network of ground-based long-range radars and telescopes, space-based telescopes, and a network of infrared satellites in geostationary orbit. The most recent generation of those satellites is the Space-Based Infrared System (SBIRS).[22]

The US does not have a dedicated operational direct ascent anti-satellite (ASAT) capability. However, it does have operational midcourse missile defence interceptors that have, in the past, been demonstrated in an ASAT role against satellites in low earth orbit, which could, therefore, provide the capability if so required.

While the US does not currently have an acknowledged programme to develop co-orbital (space-to-space) capabilities, the technological capability developed as part of its ASAT testing and early missile defence programmes,[23] is considered significant enough to allow the US to develop a co-orbital ASAT capability in a relatively short period of time.[24]

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[20] *Report of the Commission to Assess United States National Security Space Management and Organization*, January 2001, p.8-9.

[21] US Air Force Space Command, *Strategic Master Plan FY06 and Beyond,* October 2003. Among the missile defence measures was provision for the "development and testing of space-based defences, specifically space-based kinetic energy (hit-to-kill) interceptors and advanced target tracking satellites" (US Department of Defense Press Release, 17 December 2002).

[22] Which replaced the Defence Support Program in 2011.

[23] In the early 00's the Near Field Infra-Red Experiment (NFIRE) satellite programme was considered of particular importance as it would carry a kinetic kill vehicle that would have the ability to both intercept an ICBM in low earth orbit, but also target other satellites if necessary. That element of the NFIRE programme was removed in 2006.

[24] Global counterspace capabilities, Secure World Foundation, April 2021, p.xi

The US has an operational electronic warfare counterspace system (the Counter Communications System) which is deployed globally and has the potential to provide uplink jamming capability against geostationary communications satellites. An upgrade to the CCS (codenamed Meadowlands) is currently underway. The US military also has the capability to jam the civil signals of global navigation satellite services such as the Russian Glonass and Chinese Beidou systems.

With respect to direct energy weapons, the Secure World Foundation assesses:

> Over the past several decades the United States has conducted significant research and development on the use of ground-based high energy lasers for counterspace and other purposes. We assess that there are no technological roadblocks to the US operationalizing them for counterspace operations. With its SLR [satellite laser ranging] sites ad defense research facilities, the United States possess low power laser systems with the capability to dazzle, and possibly blind, earth observation imaging satellites. However, there is no indication that these potential high or low power capabilities have been operationalized.[25]

2020 Defence Space Strategy

In June 2020 the Department of Defense published its latest Defence Space Strategy, in which it acknowledged space as a "complex security environment characterized by great power competition [...] primarily with China and Russia", and a "contested warfighting domain".

Recognising that the US defence space strategy "was not built for the current strategic environment" and that "the intentions and advancements of potential adversaries in space are threatening the ability of the United States to deter aggression, to protect US national interests, and to fight and win future conflicts", the strategy therefore details "the most significant transformation in the history of the US national security space program" in order to "ensure US space superiority and to secure the Nation's vital interests in space". It sets out four main objectives:

1. To build a comprehensive military advantage in space.
2. To integrate military space power into national, joint and combined operations.
3. To shape the strategic environment in space.
4. To cooperate with allies, partners, industry and other US Government departments agencies in this area.

It builds upon the US Space Force, US Space Command and the Space Development Agency that were established in December 2019. The newly

[25] Global counterspace capabilities, Secure World Foundation, April 2021, p.xii

created space force is responsible for organising, training and equipping the military, while US Space Command is the combatant command responsible for space operations. The Space Development Agency will "rapidly develop and field new space capabilities". Collaboration with allies and exploiting the synergies between military R&D and commercial space activities are seen as key to innovation and the development of "game changing capabilities".

The US recently stood up its Space Warfighting Analysis Center, which will examine shortfalls in space domain awareness, and will create a National Space Intelligence Centre in January 2022.

In a Pentagon press conference announcing the new strategy, US Deputy Assistant Secretary of Defense for Space Policy, Stephen Kitay, said that US actions were "consistent with its obligations under the Outer Space Treaty and other relevant international and national law" and referred to the capacity to act in self-defence in space, if necessary.[26]

Future Capabilities

What the Defence Space Strategy does not do, however, is identify specific counterspace capabilities going forward. As the Secure World Foundation noted in April 2021:

> It is possible that the United States has also begun development of new offensive counterspace capabilities, although there is no publicly available policy or budget direction to do so.[27]

As part of the US' 2019 Missile Defense Review (MDR) there have been a number of studies being undertaken by the US Department of Defense and the Missile Defence Agency to enhance existing space situational awareness capability and address the threat of increasingly advanced missiles, including hypersonic missiles, using a constellation of satellites in low earth orbit. Those studies are now part of the Space Development Agency's National Defense Space Architecture strategy, which is a proposed multi-layered network of satellite constellations in low earth orbit. Each layer will have a specific role and be equipped with specialised satellites to perform each task. In September 2020 the SDA launched its first tranche of programmes.

As part of the Missile Defence Review, the Department of Defense also committed to examine the "operational potential of space-basing [of interceptors] in the evolving security environment" and "identify the most promising technologies, and estimated schedule, cost, and personnel requirements". That work is ongoing. In a January 2021 report the US Congressional Budget Office estimated that any potential programme could cost between $40 billion and $250 billion over a 20-year period, depending upon the number of satellites and interceptors deployed and launch costs.

[26] US Department of Defense press briefing, 17 June 2020

[27] Global counterspace capabilities, Secure World Foundation, April 2021

Biden's FY2022 budget request

On 28 May 2021 the Biden administration presented its Department of Defense budget request for the 2022 fiscal year. That request gave some insight into the priorities being afforded to the space domain by the new administration, although many programmes remain classified.

As part of that request $20.6 billion is allocated to strengthening US capability in space "to deter conflict and prevail in a global all-domain fight".[28] Among the more high-profile programmes:

- $2.6 billion for the Next Generation Overhead Persistent Infrared (OPIR) satellite, which will combine with existing GEO satellites and associated ground systems to "increase missile warning, missile defence, battlespace awareness and technical intelligence".[29] Initial launch capability for the first polar satellite is earmarked for 2028.
- $1.8 billion for two GPS follow-on satellites and upgrades to the existing GPS system.
- $1.7 billion to fund five new space-launched vehicles.

$20 million has also been allocated to establish the National Space Intelligence Center, first identified in the 2020 Defence Space Strategy, and increases funding for deep space advanced radar capability to detect and track deep space objects.[30]

In a Pentagon press briefing, the US Air Force Deputy Assistant Secretary for Budget, Major General James Peccia, also noted:

> There are well over $800 million in classified programs that went to the Space Force this year for new programs. But we can't talk about those.[31]

The FY22 funding request for the US Missile Defense Agency also included $292 million for programmes providing better situational awareness in space.[32] One such programme is the Hypersonic and Ballistic Tracking Space Sensor project, being jointly developed with the US Space Force as part of its OPIR programme.

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[28] Department of Defense press briefing on the President's Fiscal Year 2022 Defense Budget, 28 May 2021

[29] Department of Defense Press Briefing on the President's Fiscal Year 2022 Defense Budget for the Department of the Air Force, 28 May 2021

[30] ibid

[31] Ibid

[32] Department of Defense press briefing on the President's Fiscal Year 2022 Defense Budget for the Missile Defense Agency, 28 May 2021

5.2 Russia

The Soviet Union was arguably the first to militarise space when it launched the Sputnik satellite in 1957. Like the United States, the Soviet Union developed an extensive space presence during the Cold War and experimented in offensive counterspace capabilities primarily aimed at the United States. Following the collapse of the Soviet Union, Russia signalled its intention to remain a major actor in space, considering it a strategic military region and a sign of international prestige, and in 1992 Russia created the world's first Space Force and the Russian Space Agency. Russia has also been part of the International Space Station since it was launched in 1998.

It wasn't until 00s and signs of recovery in the Russian economy, however, that the Kremlin began to significantly re-invest in space as a strategic sector and prioritised rebuilding and modernising Russia's military space capabilities. Building on Soviet-era research and testing, Russia is reported to have revived many of its Cold War counterspace capability programmes, including ASAT technologies, direct energy weapons, electronic warfare, surveillance and tracking and missile defence technologies.

Not only do counterspace capabilities provide Russia with a mechanism for levelling the military playing field with the West, as Dr Beyza Unal and Mathieu Boulègue at Chatham House have also observed:

> By exploiting asymmetric advantages in space, Russia seeks to leverage its capabilities against competitors in space and in other domains, falling in line with its wider military strategy...[33]

In 2015 the Russian Space Force was merged as a new branch of Russia's Aerospace Defence Force, which combines space, air defence and missile defence under one command.

Anti-satellite (ASAT) testing

According to the Center for Strategic and International Studies:

> Russia has invested in a sweeping range of kinetic physical counterspace capabilities over the past decade, including ground- and air-launched direct-ascent ASAT missiles capable of targeting satellites in LEO and co-orbital ASAT weapons that could operate in any orbital regime. Russia's kinetic physical counterspace activities often closely resemble previously operational Soviet-era ASAT programs, suggesting that the country has benefited from decades of ASAT weapons research conducted by the Soviet Ministry of Defense.[34]

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[33] "Russia's behaviour risks weaponizing outer space", Chatham House Expert Comment, 27 July 2020

[34] Space Threat Assessment, Center for Strategic and International Studies, March 2020

In the last couple of years Russia has been in the headlines for a series of ASAT tests that would indicate significant progress in efforts to develop both a direct-ascent ASAT missile programme and a co-orbital ASAT capability.

In July 2020 the US and its allies accused Russia of conducting a further non-destructive test of a space based ASAT weapon when a Russian satellite fired a new object, at high velocity, into orbit. Hypothetically the projectile could destroy a target through kinetic impact and was therefore regarded as having the "characteristics of a weapon".[35]

US Space Command said that the event was similar to activity previously conducted by Russia in 2017 and was "evidence of Russia's continuing efforts to develop and test space-based systems, and consistent with the Kremlin's published military doctrine to employ weapons that hold U.S. and allied space assets at risk".[36]

In January 2020 the US previously raised concerns that the same Russian sub-satellite system[37] had conducted proximity operations close to a classified US government satellite in low earth orbit.

In response to the July 2020 "test", the Russian Government said:

> The testing conducted by the Russian Defence Ministry on July 15 has not endangered any other space object and, most importantly, has not infringed on any norms and principles of international law. According to our Defence Ministry, the inspector satellite was launched to inspect a Russian satellite at close range, using special equipment for this purpose. This mission has collected valuable information about the technical maintenance status of the inspected spacecraft and transmitted it to the ground-based command system.[38]

However, as Unal and Boulègue noted:

> While it is possible that Russia's matryoshka satellites have indeed been developed to carry out routine repairs of Russia's space fleet, they also have the potential to interfere with, and destroy, other satellites with such action needing to be considered a threat until Russia demonstrates otherwise.[39]

In April 2020 Russia also conducted its tenth test flight of a direct ascent ASAT missile, the Nudol PL-19. A further test was conducted in December 2020. On all occasions, the PL-19 Nudol missile was launched into low earth orbit but the lack of space debris led many to conclude that these were non-intercept

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35 Statement by Air Vice Marshal Harvey Smyth, Head of the UK's Space Directorate, MOD

36 US Space Command press release, 23 July 2020

37 The sub-satellite in question had been released into orbit from a larger satellite in late 2019, what have been referred to as matryoshka satellites.

38 Russian Ministry of Foreign Affairs, 24 July 2020

39 "Russia's behaviour risks weaponizing outer space", Chatham House Expert Comment, 27 July 2020

tests. The system is not yet operational and, according to analysts, does not have the capability to threaten targets beyond low earth orbit. Nevertheless, they demonstrate Russia's capacity to act.

Directed energy weapons, electronic warfare and cyber

Russia has also placed a high priority on integrating cyber, electronic warfare and directed energy weapons into its counterspace activities. As many analysts have noted, such capabilities play to the strengths of Russia and its willingness to operate in the "grey zone" and below the threshold of conflict.

Building on Soviet-era legacy programmes, and recently fielded laser systems, Russia is developing several ground and air-based laser systems for use by the Russian Space Force in targeting imagery and reconnaissance satellites. The Secure World Foundation suggests, however, that "there is no indication that Russia is developing, or intending to develop, high power space-based laser weapons".[40]

Since 2014 Russia has been accused of widespread electronic counterspace warfare, jamming navigation and communications satellites in nearby territories, in recent military campaigns as well as within its own borders for the protection of strategic locations. In 2018 France publicly accused Russia of seeking to intercept communication satellites of the French and Italian armed forces. Two months later, Russia was also accused of GPS interference during a NATO exercise in the Arctic regions of Norway and Finland. The Kremlin repeatedly denied any wrongdoing.[41]

The CSIS assess that:

> Although difficult to verify, Russia is also almost certainly capable of targeting satellites and associated ground stations through vulnerable computer networks. With new weapons added to the Russian counterspace arsenal each year since 2018, it is clear that the country has renewed its focus on developing and maintaining its ability to disrupt, degrade, or destroy adversaries' assets on orbit.[42]

Russia also possesses a sophisticated network of space situational awareness capabilities, which date back to the Cold War. Since 2000 Russia has undertaken a significant modernisation programme and is also "engaging in international civil and scientific cooperative efforts that likely give it access to data from SSA sensors around the globe".[43]

[40] Global counterspace capabilities, Secure World Foundation, April 2021, p.x
[41] "Russia denies disrupting GPS signals during NATO Arctic exercises", The Guardian, 12 November 2018
[42] Space Threat Assessment, Center for Strategic and International Studies, March 2020
[43] Global counterspace capabilities, Secure World Foundation, April 2021, p.x

5.3 China

In contrast to the US and Russia, China's military efforts in space are relatively recent, albeit bound up in an extensive civilian space programme.[44] In its 2016 Space White Paper, China sets out its long term strategic goal of becoming a "space power". The White Paper said nothing about defence or the military applications of its space programme, although the potential dual-use nature of many of the technologies it is developing has not gone unnoticed. In the last few years China has conducted the greatest number of space launches, and is now only second to the US in terms of the number of operational satellites in orbit (see above).

China's military efforts in space are two-fold. It is developing its own military architecture in space that will enable military activities on the ground, at the same time as developing a broad range of counterspace capabilities.

These latter capabilities have prompted considerable concern, in particular in the United States, since many of them are reported to have been operationally deployed. In 2015 China created a defence space force as part of the PLA's Strategic Support Force, which also incorporates cyber and electronic warfare.

Operational ASAT capability

In 2007 China prompted considerable criticism when it successfully launched its first direct ascent ASAT missile, the SC-19, capable of targeting low earth orbit satellites. Criticism came, not only for China's intent to develop such offensive capability, but also because it impacted a defunct Chinese weather satellite, causing significant space debris.[45]

China has spent the last decade reportedly upgrading and modernising that missile system and in 2018 the Chinese Army (the PLA) formed military units and began initial operational training. The SC-19 is now assessed to be operational. Direct ascent ASAT capability against targets in medium earth orbit and geostationary orbit are, however, considered "likely still in the experimental or development phase, and there is not sufficient evidence to conclude whether there is an intent to develop it as an operational capability in the future".[46]

China is also thought to have developed, and fielded, co-orbital ASAT capabilities, including satellites with robotic arm technology. While it has been asserted that such capabilities are for inspection and repair of existing satellites, many analysts concur that such technology could also function in

[44] Although their civilian space programme has its foundations in the 1970s when Beijing launched its first satellite.

[45] China's ASAT test in 2007 generated an estimated 3,000 trackable pieces of space debris.

[46] Global Counterspace Capabilities, Secure World Foundation, p.vii

space as a weapon given its ability to damage, or alter the orbit of, another satellite.

Non-kinetic technologies

Like Russia, China has also been investing significantly in non-kinetic counterspace technologies, such as direct energy weapons and electronic warfare. Arguably to level the playing field and address the dominance of the United States in this domain. As Alexandra Stickings and Veerle Nouwens, writing in RUSI Newsbrief, acknowledge:

> Non-kinetic technologies are able to disrupt the operations of an adversary or deny access to either their space-based assets or downstream information. They are also those more likely to be employed by actors such as Russia and China as a strategy of hybrid warfare in space, attempting to remain below any threshold that would provoke a retaliatory response by the US. [47]

China is reported to have developed high powered lasers capable of blinding commercial and military imaging satellites. Believed to be ground-based at present, their operational status and maturity has, however, been questioned. The potential for them to be deployed in a co-orbital (space-to-space) capacity has also been noted.

Advancements in high powered microwave and radio frequency weapons capable of jamming communication and navigation systems, including dedicated military communication systems, are also reported to have been made.

In 2018 the US Director of National Intelligence said that China had made the development and deployment of DEW and electronic warfare systems, a high priority. In September 2019 US Chief of Space Operations, General John J. Raymond similarly noted that, "we're pretty comfortable [in asserting] that they are developing directed energy weapons — probably building lasers to blind our satellites."

China also has advanced cyber capabilities and, over the last few years, has been accused of several cyber attacks against US satellites. In 2007 and 2008 China was considered to be a prime suspect in a number of attacks against US satellites. In November 2014 hackers with suspected links to China also forced a temporary shut down of the US weather satellite network. [48]

In March 2020 a detailed report on China's space and counterspace capabilities was prepared for the US-China Economic and Security Review Commission. Among its key findings was the conclusion that "China has an

[47] "The implications of Chinese developments in non-kinetic space technology", RUSI Newsbrief, April 2018

[48] Alexandra Stickings and Veerle Nouwens, "The implications of Chinese developments in non-kinetic space technology", RUSI Newsbrief, April 2018

operational counterspace capability that will evolve through 2020 and out to 2035".

In its 2020 annual report to Congress on China's military power, the US Department of Defense also noted that China's "space enterprise continues to mature rapidly" and that:

> The PRC continues to strengthen its military space capabilities, despite its public stance against the weaponization of space. The PLA continues to invest in improving its capabilities in space-based intelligence, surveillance, and reconnaissance (ISR), satellite communication, satellite navigation, and meteorology, as well as human spaceflight and robotic space exploration. China plans to have a permanently operating space station by 2022 that will host its own and foreign payloads and astronauts. China has built an expansive ground support infrastructure to support its growing on-orbit fleet and related functions including spacecraft and space launch vehicle (SLV) manufacture, launch, C2, and data downlink. Additionally, the PRC continues to develop counterspace capabilities—including direct ascent, co-orbital, electronic warfare, and directed energy capabilities—that can contest or deny an adversary's access to and operations in the space domain during a crisis or conflict. [49]

Indeed, Chinese space officials frequently depict China as a major space power behind Russia and the United States. An article in Jane's Defence Weekly in April 2021 suggested that "China intends to surpass Russia as a leading space power by 2030 and replace the US as the leading space power by 2045". [50]

5.4 Other countries

As outlined above, there has been a proliferation of space actors in the last decade or so.

India

One of the most notable is India which, in March 2019, became only the fourth country to successfully test a direct ascent ASAT missile. After reaching low earth orbit it successfully intercepted an Indian satellite that has been launched earlier in 2019. It was the first debris creating test of such capability since China's previous test in 2007, and provoked international concern. Indian Prime Minister, Narendra Modi, however, hailed the test as an

[49] US Department of Defense, *Military and security developments involving the People's Republic of China*, 2020

[50] "New space race: China advances its space capabilities for future warfare", Jane's Defence Weekly, 13 April 2021

"unprecedented achievement", confirming that India has "established itself as a space power".[51] Timothy Wright of the International Institute for Strategic Studies commented:

> The advent of this weapon marks India's entry into an exclusive club that currently has only four full members. There is little chance this number will remain static.[52]

He went on to conclude:

> Although the weaponisation of space is not inevitable, the behaviour of China, Russia and the United States, and now also India, suggests it is likely.[53]

India is also reported to be in the early stages of working on directed energy weapons in a counterspace context.[54]

France

In July 2019 France published its first Defence Space Strategy. Although an acknowledged space power in terms of existing military architecture, to ensure France's freedom of action and decision making in space that strategy acknowledges space as an operational military domain. It included plans for a new Space Command within the French Air Force, which was subsequently stood up in September 2019. Significantly, it also proposed the potential weaponisation of French satellites for the self defence of its space-based assets. The strategy states:

> This new environment implies a space defence strategy founded on the protection of our capabilities. That involves first and foremost improving our space situational awareness (SSA), especially in order to detect and attribute unfriendly or hostile acts in all orbits of interest and defend ourselves against them [...]
>
> Active and passive measures to protect satellites whose placement in orbit is already scheduled will be stepped up. In addition, a genuine capability for action in space will be acquired by 2030...

Separately, the French Defense Minister stated that France would improve space situational awareness and provide active defences, such as small patrolling satellites, onboard monitoring cameras and space-based laser capabilities to protect important space assets. French defence spending to 2025 already includes €3.6 billion for the renewal of France's military space infrastructure, including new families of reconnaissance, intelligence and communications satellites. In line with France's expanded ambitions for

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51 "Modi hails India as military space power after anti-satellite missile test", Reuters, 27 March 2019

52 "Do ASATs mean less security in space?", IISS Military Balance Blog, 17 March 2020

53 ibid

54 Global counterspace capabilities, Secure World Foundation, April 2021, p.xii

space, these additional measures will see an additional €700 million invested in space capability.

France has, however, maintained that its space strategy is purely defensive, irrespective of the intention to place non-kinetic counterspace capabilities on French satellites and reiterates its right to self defence under international law.

NATO

NATO considers that attacks to, from, or within space could lead to the invocation of Article V.

In November 2019 NATO declared space to be an operational domain for the Alliance. In the previous June NATO Ministers approved a space policy, although details have remained classified. It was, therefore, initially unclear whether NATO's Article V security guarantee applied to space assets.

However, at a meeting of Heads of State and Government on 14 June 2021 the Alliance provided clarification on this point:

> Consistent with the Overarching Space Policy, NATO's approach to space will remain fully in line with international law. We support the international efforts to promote responsible behaviour in space. We consider that attacks to, from, or within space present a clear challenge to the security of the Alliance, the impact of which could threaten national and Euro-Atlantic prosperity, security, and stability, and could be as harmful to modern societies as a conventional attack. Such attacks could lead to the invocation of Article 5. A decision as to when such attacks would lead to the invocation of Article 5 would be taken by the North Atlantic Council on a case-by-case basis.[55]

Towards the end of 2020 NATO established a new Space Command Centre in Germany to ensure space support for NATO operations sharing information and coordinating activities. In early 2021 NATO announced that a space centre of excellence would also be established in Toulouse.

However, NATO has stated that as an alliance:

> NATO is an important forum for Allies to share information, increase interoperability and coordinate actions. The Alliance is not aiming to develop space capabilities of its own and will continue to rely on national space assets. NATO's approach to space will remain fully in line with international law. NATO has no intention to put weapons in space.[56]

[55] NATO , Brussels Summit Communique, 14 June 2021, para.33

[56] NATO's approach to Space, 22 April 2021

Iran

In April 2020 Iran launched its first military satellite (Noor-1) into space using its new Qased space launch vehicle. Iran has launched a number of satellites in the past as part of its fledgling civil space programme, but this represents the first steps by the Islamic Revolutionary Guard Corps' Aerospace Force into the military sphere. At the time, the Head of the IRGC Aerospace Force Brigadier General Amir Hajizadeh indicated that the launch had been a success and that "the IRGC intends to launch a second satellite into a higher orbit in the "not-too-distant" future".[57]

On 10 June 2021, and ahead of a meeting between US President Biden and Russian President Vladimir Putin, The Washington Post reported that Russia is in the process of supplying Iran with an advanced satellite system, the Kanopus V, which will provide Iran with greatly enhanced reconnaissance and surveillance capabilities. While the satellite is primarily civilian, the IRGC is reported to have been heavily involved in negotiations, leading to the assumption that the satellite will be used for military purposes.

Australia

On 19 May 2021 the Australian Government also announced its intention to establish a new space division within the Royal Australian Air Force. The roles of the division will be informed by a defence space review, which is currently underway. The division is expected to be stood up in early 2022.

2 Suggested reading

- Global Counterspace capabilities, Secure World Foundation, 2021
- Space threat assessment 2020, Center for Strategic and International Studies, March 2020

[57] "Iran launches military satellite", Arms Control Today, May 2020

6 The UK's focus on space

In June 2003 the Vice Chief of the Defence Staff, Air Chief Marshal Sir Anthony Bagnall, addressed a conference at the Royal United Services Institute (RUSI) on the military use of space. During that speech he outlined the UK's priorities for future space-based systems:

> The military use of space is here and it is not going to go away. It is not certain how it will develop, and whether we might in the future, for example, face new risks from space-based weapons. However we decide to go forward, we need to be able to integrate space-based systems with the rest of our capabilities and ensure that they will work with existing legacy systems. We must build flexibility into the systems themselves and into the way in which we can deploy the people who have to operate and sustain them. [58]

"The threat from adversaries in this rapidly maturing domain is real and it is here now. If we fail to understand how to operate successfully in the Space Domain through integrated operations, we lose our battle-winning edge".

Air Vice-Marshal Harv Smyth, Director Space, UK Ministry of Defence, February 2021

The strategic importance of space and the national security implications of protecting the UK's space-based assets was openly acknowledged in the UK's first ever National Space Policy, published in 2015.

In 2018 RAF Air Command assumed command and control of UK military space operations to defend the UK's interests in space; while the MOD announced that the number of personnel working in the UK defence space sector would be increased to over 600 personnel by 2023.[59] In March 2018 the RAF launched its first ever satellite, the Carbonite II, to deliver high-quality imagery and full-motion colour video from space.[60]

In summer 2018 the MOD was also expected to publish its first defence space strategy to address the threats and opportunities that face the UK in this domain. In May 2018 the Department published the "headlines" of its intended strategy, which set out a vision of securing "freedom of action in space" that fully exploited "its military and civil potential". That document acknowledged the synergies between the civilian and military sectors and the need to work across Government, the private sector and with international partners.[61]

[58] "Space as an enabler in modern military operations", *RUSI Journal,* August 2003

[59] From a baseline of 500 personnel (MOD press release, 21 May 2018)

[60] The programme was also intended to help the MOD and the RAF understand the potential operational and cost benefits that could be offered in the future by a constellation of small satellites.

[61] The MOD already has links with the multinational Combined Space Operations (CSpO) initiative, which improves cooperation amongst the Five Eyes community, plus France and Germany. It also works closely with US and NATO allies.

However, the full strategy subsequently never materialised.[62] In January 2020 the MOD stated:

> The Defence Space Strategy has developed significantly. We are currently reviewing the right timing for publication and how best to align it with the emerging National Space Strategy. The Ministry of Defence is firmly committed to a number of space programmes, and we are assessing our space capabilities, coherence and requirements.[63]

6.1 A new integrated approach

The 2021 Integrated Review and associated Defence Command Paper, set out the UK's ambition to be "a meaningful player in space" by 2030.

In this timeframe the aim is to have "the ability to monitor, protect and defend our interests in and through space, using a mixture of sovereign capabilities and burden-sharing partnerships with our allies".[64]

"There is a national ambition to gain and maintain a competitive edge in space".

General Sir Gordon Messenger, Vice Chief of the Defence Staff

Recognising that there will be "considerable risks to strategic stability" if competition in space is not managed and regulated effectively, the Government is also committed to leading international efforts to "develop norms, rules and principles of responsible behaviours in space".[65]

Over the next decade, the MOD will invest around £5 billion on recapitalising and enhancing its satellite communication capabilities, through the delivery of the Skynet 6 programme from 2025 onwards, and a further £1.4 billion on space-related capabilities. Specifically, the MOD will pursue a new UK-built intelligence, surveillance and reconnaissance (ISR) satellite constellation in low earth orbit, which would utilise electro-optical, infra-red, synthetic aperture radar and hyperspectral solutions. Such capabilities have been described as "game changing" for UK defence.[66] Plans for the next generation Skynet 7 are also currently underway.

In an interview with Air and Space Power 2020, the Director of Space, Air Vice Marshal Harv Smyth, also revealed:

> Intriguingly, there is consideration being given to additional payloads for Skynet 6. There is also some ground-breaking work on interaction between small satellites in LEO and large geostationary satellites. However, the DSEP [Defence Space Enterprise Portfolio] is

[62] Despite several indications from the Government that its publication was forthcoming: PQ176122, 11 October 2018; PQ202301, 19 December 2018; PQ249251, 7 May 2019; PQ276172, 16 July 2019

[63] PQ3707, Defence, 20 January 2020

[64] HM Government, Global Britain in a Competitive Age, CP403, p.58

[65] Ibid, p.57

[66] "Space vision", RAF Air and Space Power 2020, p.59 and "Space Command to bring 'huge change' for UK industry", Jane's Defence Weekly, 4 June 2021

much broader than that. "We are looking at alternative methods of delivering positioning, navigation and timing (PNT) signals, to bolster resilience in this critical area. We are investigating how to increase our Space domain awareness, so that we not only know what is in Space, but also what it is actually doing. Further areas being considered include optical communications, different types of sensing, and the use of on-orbit artificial intelligence, so that we process data on the satellite before it is downloaded to Earth.

In 2020 the MOD launched International Space Pitch Day, which is a joint UK-US initiative that aims to find, fund and fast-track innovation and technology solutions in the space domain. Ten contracts were awarded in November 2020, jointly funded by the Royal Air Force, the UK's Defence Science and Technology Laboratory and the US Air Force.

A new Space Command will be established (see below) along with a new National Space Operations Centre and a new Space Academy, to develop the skills and training of defence space personnel.[67]

6.2 A new civil/military space strategy

"[Space] is not solely a Defence programme: it must be a national effort to embed security and resilience, as well as grow prosperity for the entire nation".

Director of Space, Air Vice Marshal Harv Smyth

The Integrated Review also announced that the UK will adopt a new integrated space strategy in 2021, that will bring together military and civilian space policy for the first time.[68]

Through this strategy the UK will support the growth of the UK's commercial space sector and develop a commercial launch capability from the UK by 2022. The Sutherland Space Hub in Scotland secured planning permission in August 2020.[69]

The UK will also increase international collaboration in its space activities. The UK will continue its participation in the EU's Copernicus Earth observation programme and will deepen cooperation with NATO and the Combined Space Operations initiative, a partnership of seven nations working together to address threats and shared interests in space. Building on existing partnerships and alliances is viewed as a potential route to fulfilling capability gaps, or to developing systems that meet the needs of several

[67] MOD, Defence in a Competitive Age, para 7.16

[68] The long-awaited defence space strategy will therefore be merged with the forthcoming civil space strategy.

[69] Due to the cost, historically the UK has relied on allies and third-party capabilities, such as the US, India and the European Space Agency to deliver UK satellites into orbit. Background on the

countries that face similar threats, such as those of the five eyes intelligence network.[70]

6.3 Joint Space Command

In November 2020, and as part of the first outcomes of the Integrated Review, the Prime Minister announced that a new Joint Space Command would be established.

Space Command was formally established on 1 April 2021. It is based at RAF High Wycombe[71] and staffed from all three Services, the civil service and key members of the commercial space sector. It will bring together the functions of space operations, space workforce generation and space equipment capability. It has assumed control of some pre-existing operational assets such as the UK Space Operations Centre and RAF Fylingdales, which is a ballistic missile warning and space monitoring station. It will also assume operational control of the Skynet communications satellite system.

Strategic Command will continue to lead on the development of joint enabling capabilities across all military domains, including cyber and space. In the space domain such capabilities include satellite communications, position, navigation and timing as well as intelligence surveillance and reconnaissance.

In February 2021 Air Commodore Paul Godfrey was announced as the new Commander, United Kingdom Space Command.

The new National Space Council[72] will provide strategic policy direction, through the recently formed Space Directorate within the MOD. Space Command will also work with the UK Space Agency, where necessary, to "deliver joint national space capability".[73]

development of space ports in the UK is available in House of Commons Library Insight: When will UK spaceports be ready for lift off?, April 2019. It was also discussed at length in two recent debates on the UK space industry: House of Lords, UK space industry, 4 March 2021 and House of Commons, Future of the UK space industry, 4 February 2021.

70 The United States, Canada, Australia New Zealand and the UK.

71 Which is already home to the National Air and Space Operations Centre [NASOC]).

72 The 2019 Queen's Speech outlined the Government's intention to establish a National Space Council and to launch a new National Space Strategy. The terms of reference of the new Council are "to consider issues concerning prosperity, diplomacy and national security in, through and from Space, as part of coordinating overall Government policy". The Defence Secretary is a member of the Council.

73 RAF press release, 1 February 2021

3 Suggested reading

- Interview with Air Chief Marshal Mike Wigston, Chief of the Air Staff, C4ISRNET, 14 May 2021
- The UK Space Industry, House of Commons Library, 23 April 2021
- Defence Committee, Inquiry: Space Defence (deadline for submissions is 1 July 2021)
- "Eyes in the sky: space and the Defence Command Paper", RUSI Defence Systems, 30 March 2021
- Defence Committee, Oral evidence: The Integrated Review – Threats, Capabilities and Concepts, HC834, 29 September 2020
- Ministry of Defence, Towards a Defence Space Strategy, 2018

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