Executive Summary—

GLOBAL COUNTERSPACE CAPABILITIES

An Open Source Assessment

> 04 | 2024

SECURE WORLD FOUNDATION

ABOUT SECURE WORLD FOUNDATION

Secure World Foundation (SWF) is a private operating foundation that promotes cooperative solutions for space sustainability and the peaceful uses of outer space. The mission of the Secure World Foundation is to work with governments, industry, international organizations, and civil society to develop and promote ideas and actions to achieve the secure, sustainable, and peaceful uses of outer space benefiting Earth and all its peoples.

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Dr. Brian Weeden is the Chief Program Officer for Secure World Foundation and has more than two decades of professional experience in space operations and policy.

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Prior to joining SWF, Dr. Weeden served nine years on active duty as an officer in the United States Air Force working in space and intercontinental ballistic missile (ICBM) operations. As part of US Strategic Command's Joint Space Operations Center (JSpOC), Dr. Weeden directed the orbital analyst training program and developed tactics, techniques and procedures for improving space situational awareness.

Respected and recognized as an international expert, Dr. Weeden's research and analysis have been featured in *The New York Times*, *The Washington Post*, *National Public Radio*, *USA Today*, *The BBC*, *Fox News*, *China Radio International*, *The Economist*, The World Economic Forum's Annual Meeting in Davos, academic journals, presentations to the United Nations, and testimony before the US Congress.

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Ms. Victoria Samson is the Chief Director, Space Security and Stability for Secure World Foundation and has over 25 years of experience in military space and security issues.

Before joining SWF, Ms. Samson served as a Senior Analyst for the Center for Defense Information (CDI), where she leveraged her expertise in missile defense, nuclear reductions, and space security issues to conduct in-depth analysis and media commentary. Prior to her time at CDI, Ms. Samson was the Senior Policy Associate at the Coalition to Reduce Nuclear Dangers, a consortium of arms control groups in the Washington, D.C. area, where she worked with Congressional staffers, members of the media, embassy officials, citizens, and think-tanks on issues surrounding dealing with national missile defense and nuclear weapons reductions. Before that, she was a researcher at Riverside Research Institute, where she worked on war-gaming scenarios for the Missile Defense Agency's Directorate of Intelligence.

Known throughout the space and security arena as a thought leader on policy and budgetary issues, Ms. Samson is often interviewed by multinational media outlets, including *The New York Times*, *Space News*, *The BBC*, and *NPR*. She is also a prolific author of numerous op-eds, analytical pieces, journal articles, and updates on space security matters. She is also the head of the International Astronautical Federation's task force on security and a member of the Space Security Working Group of the National Academies of Sciences, Engineering, and Medicine's Committee on International Security and Arms Control.

EXECUTIVE SUMMARY

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. From a security perspective, an increasing number of countries are looking to use space to enhance their military capabilities and national security. The growing use of, and reliance on, space for national security has also led more countries to look at developing their own counterspace capabilities that can be used to deceive, disrupt, deny, degrade, or destroy space systems.

The existence of counterspace capabilities is not new, but the circumstances surrounding them are. Today there are increased incentives for development, and potential use, of offensive counterspace capabilities. There are also greater potential consequences from their widespread use that could have global repercussions well beyond the military, as huge parts of the global economy and society are increasingly reliant on space applications.

This report compiles and assesses publicly available information on the counterspace capabilities being developed by multiple countries across five categories: direct-ascent, co-orbital, electronic warfare, directed energy, and cyber. It assesses the current and near-term future capabilities for each country, along with their potential military utility. The evidence shows significant research and development of a broad range of destructive and non-destructive counterspace capabilities in multiple countries. **However, only non-destructive capabilities are actively being used against satellites in current military operations.** The following provides a more detailed summary of each country's capabilities.

2024 GLOBAL ASSESSMENT

	US	RUSSIA	CHINA	INDIA	AUS.	FRANCE	IRAN	ISRAEL	JAPAN	N. KOREA	S. KOREA	UK
LEO Direct Ascent	■	■	▲	■	●	●	●	●	●	●	●	●
MEO/GEO Direct Ascent	■	■	■	●	●	●	●	●	●	●	●	●
LEO Co-Orbital	■	▲	■	●	●	●	●	●	●	●	●	●
MEO/GEO Co-Orbital	■	■	■	●	●	●	●	●	●	●	●	●
Directed Energy	■	■	■	●	●	■	●	●	●	●	●	●
Electronic Warfare	▲	▲	▲	■	■	■	■	▲	■	■	●	●
Space Situational Awareness	▲	▲	▲	■	■	■	■	■	■	■	■	■

LEGEND: NONE ● SOME ■ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

1 — THE UNITED STATES

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	▲	□	?	●
MEO/GEO Direct Ascent	–	–	–	●
LEO Co-Orbital	□	?	–	●
MEO/GEO Co-Orbital	□	?	–	●
Directed Energy	▲	□	?	●
Electronic Warfare	▲	▲	▲	▲
Space Situational Awareness	▲	▲	▲	▲

LEGEND: NONE ● SOME □ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

The United States has conducted multiple tests of technologies for close approach and rendezvous in both LEO and GEO, along with tracking, targeting, and hit-to-kill (HTK) intercept technologies that could lead to a co-orbital antisatellite (ASAT) capability. These tests and demonstrations were conducted for other non-offensive missions, such as missile defense, on-orbit inspections, and satellite servicing, and the United States does not have an acknowledged program to develop co-orbital capabilities. However, the United States possesses the technological capability to develop a co-orbital capability in a short period of time if it chooses to.

While the United States does not have an operational, acknowledged direct ascent antisatellite (DA-ASAT) program, it does have operational midcourse missile defense interceptors that have been demonstrated in an ASAT role against a low LEO satellite. The United States has developed dedicated DA-ASATs in the past, both conventional and nuclear-tipped, and likely possesses the ability to do so in the near future should it choose so.

The United States has an operational electronic warfare (EW) offensive counterspace system, the Counter Communications System (CCS), which is deployed globally to provide uplink jamming capability against geostationary communications satellites. The United States has also initiated a program called Meadowlands to upgrade the CCS capabilities. Through its Navigation Warfare program, the United States has the capability to jam and interfere with the civil signals of global navigation satellite services (GNSS) within a local area of operation to prevent their effective use by adversaries and has demonstrated doing so in several military exercises. The United States likely could jam military GNSS signals as well, although the effectiveness is difficult to assess based on publicly available information. The effectiveness of US measures to counter adversarial jamming and spoofing operations against military GPS signals is not known.

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 United States operationalizing them for counterspace applications. With its Satellite Laser Ranging (SLR) sites and defense research facilities, the United States possesses low-power laser systems with the capability to dazzle, and possibly blind, Earth observation (EO) imaging satellites. However, there is no indication that these potential high or low power capabilities have been operationalized.

There is no public evidence that the United States has a space-based directed energy weapons (DEW) capability. The Missile Defense Agency (MDA) is planning to conduct research into the feasibility of DEW for defending against ballistic missiles and the Space Force has expressed an interest in a directed energy architecture in general (not necessarily space-based). If developed, these systems may have a capability against other orbiting satellites and, depending on their target acquisition and tracking capabilities may be considered de facto anti-satellite systems.

The United States currently possesses the most advanced SSA capabilities in the world, particularly for military applications. US SSA capabilities date to the beginning of the Cold War and leverage significant infrastructure developed for missile warning and missile defense. The core of its SSA capabilities is a robust, geographically dispersed network of ground-based radars and telescopes and space-based telescopes. The United States is investing heavily in upgrading its SSA capabilities by deploying new radars and telescopes in the Southern Hemisphere, upgrading existing sensors, and signing SSA data sharing agreements with other countries and satellite operators. The United States still faces challenges in modernizing the software and computer systems used to conduct SSA analysis and is increasingly looking to leverage commercial capabilities.

The United States has had established doctrine and policy on counterspace capabilities for several decades, although not always publicly expressed. Most US presidential administrations since the 1960s have directed or authorized research and development of counterspace capabilities, and in some cases greenlit testing or operational deployment of counterspace systems. These capabilities have typically been limited in scope and designed to counter a specific military threat, rather than be used as a broad coercive or deterrent threat. The current US military doctrine includes offensive and defensive military force and is focused on suppressing adversary uses of space in an armed conflict while protecting the United States' ability to use space.

The United States recently underwent a major reorganization of its military space activities as part of a renewed focus on space as a warfighting domain. Since 2014, US policymakers have placed increased focus on space security, and have increasingly talked publicly about preparing for a potential "war in space." This rhetoric has been accompanied by a renewed focus on reorganizing national security space structures and increasing the resilience of space systems. This has culminated in the reestablishment of US Space Command (USSPACECOM) and the creation of the US Space Force (USSF), which assumed the responsibilities of US Strategic Command for space warfighting and Air Force Space Command (AFSPC) for operating, training, and equipping of space forces, respectively. To date, the missions of these new organizations are largely a continuation of previous military space missions, although some have advocated for expanding their focus to include cislunar activities and more offensive weapons. It is possible that the United States has also begun developing new offensive counterspace capabilities, although the United States has publicly stated it will not test destructive DA-ASAT weapons. The United States also continues to hold annual space wargames and exercises that increasingly involve close allies and commercial partners.

2 — RUSSIA

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	▲	▲	?	●
MEO/GEO Direct Ascent	–	–	–	●
LEO Co-Orbital	▲	▲	?	●
MEO/GEO Co-Orbital	■	–	–	●
Directed Energy	▲	■	?	●
Electronic Warfare	▲	▲	▲	▲
Space Situational Awareness	▲	▲	▲	▲

LEGEND: NONE ● SOME ■ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

There is strong evidence that Russia has embarked on a set of programs since 2010 to regain offensive counterspace capabilities. Since 2010, Russia has been testing technologies for RPO in both LEO and GEO that could lead to or support a co-orbital ASAT capability, and some of those efforts have links to a Cold War-era LEO co-orbital ASAT program. Additional evidence suggests Russia may have started a new co-orbital ASAT program called Burevestnik, potentially supported by a surveillance and tracking program called Nivelir. The technologies developed by these programs could also be used for non-aggressive applications, including surveilling and inspecting foreign satellites, and most of the on-orbit RPO activities done to date match these missions. However, Russia has deployed two "sub-satellites" at high velocity, which suggests at least some of their LEO RPO activities are of a weapons nature.

Russia has long had the potential for a DA-ASAT capability through its historical ballistic missile defense capabilities and had DA-ASAT development programs in the past that never fully became operational. In November 2021, after more than a decade of development and testing, Russia successfully demonstrated a DA-ASAT capability against a LEO satellite. It is unclear whether this system, the Nudol, will become operational soon, and it does not appear to have the capability to threaten targets beyond LEO.

Russia places a high priority on integrating electronic warfare (EW) into military operations and has been investing heavily in modernizing this capability. Most of the upgrades have focused on multifunction tactical systems whose counterspace capability is limited to jamming of user terminals within tactical ranges. Russia has a multitude of systems that can jam GPS receivers within a local area, potentially interfering with the guidance systems of unmanned aerial vehicles (UAVs), guided missiles, and precision-guided munitions (PGMs), but has no publicly known capability to interfere with the GPS satellites themselves using radio frequency interference. The Russian Army fields several types of mobile EW systems, some of which can jam specific satellite communications user terminals within tactical ranges. Russia can likely jam communications satellites uplinks over a wide area from fixed ground stations facilities. Russia has operational experience in the use of counterspace EW capabilities from current military campaigns, as well as using it within Russia for protecting strategic locations and VIPs. New evidence suggests Russia may be developing high-powered space-based EW platforms to augment its existing ground-based platforms.

Russia has a strong technological knowledge base in directed energy physics and is developing a number of military applications for laser systems in a variety of environments. Russia has a mobile ground-based laser dazzler

system, Peresvet, that is linked to protection of their road mobile intercontinental ballistic missile force. Russia may have revived a legacy program whose goal is to develop an aircraft-borne laser system for targeting the optical sensors of imagery reconnaissance satellites, although there is no indication that an operational capability has been achieved. Although not their intended purpose, Russian ground-based satellite laser ranging (SLR) facilities could be used to dazzle the sensors of optical imagery satellites. There is no indication that Russia is developing, or intending to develop, high-power space-based laser weapons.

Russia has sophisticated SSA capabilities that are likely second only to the United States. Russian SSA capabilities date to the Cold War and leverage significant infrastructure originally developed for missile warning and missile defense. Although some of these capabilities atrophied after the fall of the Soviet Union, Russia has engaged in several modernization efforts since the early 2000s to reinvigorate them. While the government owned and operated SSA capabilities are limited to the geographic boundaries of the former Soviet Union, Russia is engaging in international civil and scientific cooperative efforts that likely give it access to data from SSA sensors around the globe. Today, Russia maintains a catalog of Earth-orbiting space objects in LEO that is somewhat smaller than that of the United States but a slightly more robust catalog of HEO and GEO objects.

Russian military thinkers see modern warfare as a struggle over information dominance and net-centric operations that can often take place in domains without clear boundaries and contiguous operating areas. To meet the challenge posed by the space aspect of modern warfare, Russia is pursuing lofty goals of incorporating EW capabilities throughout its military to both protect its own space-enabled capabilities and degrade or deny those capabilities to its adversary. In space, Russia is seeking to mitigate the superiority of US space assets by fielding a number of ground-, air-, and space-based offensive capabilities. Russia has recently reorganized its military space forces into a new organization that combines space, air defense, and missile defense capabilities. Although technical challenges remain, the Russian leadership has indicated that Russia will continue to seek parity with the United States in space.

3 — CHINA

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	▲	▲	▲	●
MEO/GEO Direct Ascent	■	■	–	●
LEO Co-Orbital	■	?	–	●
MEO/GEO Co-Orbital	■	–	–	●
Directed Energy	▲	■	–	●
Electronic Warfare	▲	▲	▲	■
Space Situational Awareness	▲	▲	▲	?

LEGEND: NONE ● SOME ■ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

China has conducted multiple tests of technologies for close approach and rendezvous in both low-earth orbit (LEO) and geostationary earth orbit (GEO) that could lead to a co-orbital ASAT capability. However, the public evidence indicates they have not conducted an actual destructive intercept of a target, and there is no proof that these technologies are definitively being developed for counterspace use as opposed to intelligence gathering or other purposes. China has at least one, and possibly as many as three, programs underway to develop DA-ASAT capabilities, either as dedicated counterspace systems or as midcourse missile defense systems that could provide counterspace capabilities. China has engaged in multiple, progressive tests of these capabilities since 2005, indicating a serious and sustained organizational effort. Chinese DA-ASAT capability against LEO targets is likely mature and may be operationally fielded on mobile launchers. Chinese DA-ASAT capability against deep space targets (medium Earth orbit, or MEO, and GEO) is likely still in the experimental or development phase, and there is not sufficient evidence to conclude whether it will become an operational capability in the near future.

China is likely to have significant EW counterspace capabilities against GNSS and satellite communications, although the exact nature is difficult to determine through open sources. Chinese military doctrine places a heavy emphasis on electronic warfare as part of the broader information warfare, and in recent years, China has taken steps to integrate space, cyber, and electronic warfare capabilities under a single military command. While there is significant evidence of Chinese scientific research and development of EW capabilities for counterspace applications and some open-source evidence of Chinese EW counterspace capabilities being deployed, there is no public evidence of their active use in military operations.

China is likely to be developing directed energy weapons (DEW) for counterspace use, although public details are scarce. There is strong evidence of dedicated research and development and reports of testing at five different locations, but limited details on the operational status and maturity of any fielded capabilities.

China is developing a sophisticated network of ground-based optical telescopes and radars for detecting, tracking, and characterizing space objects. Like the United States and Russia, several of the Chinese SSA radars also serve missile warning functions. While China lacks an extensive network of SSA tracking assets outside its borders, it does have a fleet of tracking ships and is developing relationships with countries that may host future sensors. Since 2010, China has deployed several satellites capable of

conducting RPO on orbit, which likely aids in its ability to characterize and collect intelligence on foreign satellites.

Although official Chinese statements on space warfare and weapons have remained consistently aligned to the peaceful purposes of outer space, unofficially they have become more nuanced. China has recently designated space as a military domain, and military writings state that the goal of space warfare and operations is to achieve space superiority using offensive and defensive means in connection with their broader strategic focus on asymmetric cost imposition, access denial, and information dominance. In 2016, China reorganized its space and counterspace forces, as part of a larger military reorganization, and placed them in a new major force structure that also has control over electronic warfare and cyber. China's considerable investment in developing and testing counterspace capabilities, as detailed in this chapter, suggest they see space as a domain for future conflicts, whether or not that is officially stated. That said, it is uncertain whether China would fully utilize its offensive counterspace capabilities in a future conflict or whether the goal is to use them as a deterrent against US aggression. There is no public evidence of China actively using destructive counterspace capabilities in current military operations, although it is likely they are using SSA and electronic warfare in at least some support roles.

4 — INDIA

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	▢	▢	–	●
MEO/GEO Direct Ascent	–	–	–	●
LEO Co-Orbital	–	–	–	●
MEO/GEO Co-Orbital	–	–	–	●
Directed Energy	▢	–	–	●
Electronic Warfare	▢	▢	?	?
Space Situational Awareness	▢	▢	?	?

LEGEND: NONE ● SOME ▢ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

India has over five decades of experience with space capabilities, but most of that has been civil in focus. It is only relatively recently that India has started organizationally making way for its military to become active users of space and creating explicit military space capabilities. India's military has developed indigenous missile defense and long-range ballistic missile programs that could lead to DA-ASAT capabilities, should the need arise. India demonstrated its ASAT capability in March 2019 when it destroyed one of its satellites. While India continues to insist that it is against the weaponization of space, India may be moving toward an offensive counterspace posture. India is reportedly in the early stages of working on directed energy weapons.

6 — AUSTRALIA

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	–	–	–	●
MEO/GEO Direct Ascent	–	–	–	●
LEO Co-Orbital	–	–	–	●
MEO/GEO Co-Orbital	–	–	–	●
Directed Energy	▢	–	–	●
Electronic Warfare	▢	–	–	–
Space Situational Awareness	▢	▢	▢	?

LEGEND: NONE ● SOME ▢ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

Australia is a relative newcomer in space, although it has long played a support role by hosting ground infrastructure for satellite communications and command and control. Recently, however, Australia has been laying the groundwork for more indigenous space capabilities, including military. It has recently started a military space organization, is building out a policy framework for its military space priorities, is putting concerted efforts and resources into building its own SSA capabilities, is examining an EW capability for its Department of Defence, and is looking into non-destructive ways in which to interfere with enemy satellites.

7 — FRANCE

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	–	–	–	●
MEO/GEO Direct Ascent	–	–	–	●
LEO Co-Orbital	–	–	–	●
MEO/GEO Co-Orbital	▢	–	–	●
Directed Energy	▢	?	–	●
Electronic Warfare	?	?	?	?
Space Situational Awareness	▢	▢	▢	?

LEGEND: NONE ● SOME ▢ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

While France has long had a space program, as well as military satellites, it was not until recently that France had an explicit focus on offensive and defensive counterspace activities. The major change occurred in July 2019 with the release of the first French Space Defense Strategy, which elevated French military space efforts and control of French military satellites. The French Space Defense Strategy focuses on two main areas: to improve space situational awareness around French space assets and provide them with some form of active defense against threats. While some French officials suggested machine guns on satellites, the actual plan calls for ground-based lasers for dazzling and satellites equipped for on-orbit inspections and also with offensive lasers. In 2021 and 2022, France carried out military exercises, codenamed "ASTERX," in outer space, testing the capabilities of its Space Command, as part of France's evolving goal to be the world's third-largest spatial power.

8 — IRAN

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	–	–	–	●
MEO/GEO Direct Ascent	–	–	–	●
LEO Co-Orbital	–	–	–	●
MEO/GEO Co-Orbital	–	–	–	●
Directed Energy	–	–	–	●
Electronic Warfare	▲	▲	■	■
Space Situational Awareness	■	■	?	?

LEGEND: NONE ● SOME ■ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

Iran has a nascent space program, building and launching small satellites that have limited capability. Technologically, it is unlikely Iran has the capacity to build on-orbit or direct-ascent anti-satellite capabilities, and little military motivation for doing so at this point. Iran's military appears to have an independent ability to launch satellites, separate from Iran's civil space program. Iran has not demonstrated any ability to build homing kinetic kill vehicles, and its ability to build nuclear devices is still constrained. Iran has demonstrated an EW capability to persistently interfere with the broadcast of commercial satellite signals, although its capacity to interfere with military signals is difficult to ascertain.

9 — ISRAËL

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	–	–	–	–
MEO/GEO Direct Ascent	–	–	–	–
LEO Co-Orbital	–	–	–	–
MEO/GEO Co-Orbital	–	–	–	–
Directed Energy	▢	▢	–	–
Electronic Warfare	▲	▲	▲	▲
Space Situational Awareness	▢	▢	?	?

LEGEND: NONE ● SOME ▢ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

In 1988, Israel became the eighth country to be able to launch its own satellite into orbit. It has maintained a space program that has largely been civil in nature and co-developed a missile defense system that has been until recently strictly for endoatmospheric interception of rockets. However, in recent years Israel has moved to expand its military space program and there is evidence it has developed counterspace capabilities. These include the recent demonstration of an exoatmospheric missile defense intercept capability and use of EW in active military conflicts. It is possible Israel has additional counterspace capabilities that are not publicly visible or documented.

10 — JAPAN

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	?	–	–	●
MEO/GEO Direct Ascent	–	–	–	●
LEO Co-Orbital	–	–	–	●
MEO/GEO Co-Orbital	–	–	–	●
Directed Energy	?	–	–	●
Electronic Warfare	■	–	–	–
Space Situational Awareness	■	■	■	–

LEGEND: NONE ● SOME ■ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

Japan has long been a well-established space actor and its space activities have historically been non-military in nature. In 2008, Japan released a Basic Space Law that allowed for national security-related activities in space and since then, government officials have begun to publicly speak about developing various counterspace capabilities or developing military SSA capacity. Japan is currently undergoing a major reorganization of its military space activities and the development of enhanced SSA capabilities to support military and civil applications. While Japan does not have any acknowledged offensive counterspace capabilities, it is exploring whether to develop them. Japan does have a latent ASAT capability via its missile defense system but has never tested it in that capacity.

11 — NORTH KOREA

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	–	–	–	●
MEO/GEO Direct Ascent	–	–	–	●
LEO Co-Orbital	–	–	–	●
MEO/GEO Co-Orbital	–	–	–	●
Directed Energy	–	–	–	●
Electronic Warfare	▲	□	□	?
Space Situational Awareness	?	?	?	–

LEGEND: NONE ● SOME □ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

North Korea has no demonstrated capability to mount kinetic attacks on space assets: neither a DA-ASAT nor a co-orbital system. In its official statements, North Korea has not mentioned ASAT operations or intent, suggesting that there is no clear doctrine in Pyongyang's thinking at this point. North Korea does not appear highly motivated to develop dedicated counterspace assets, though certain capabilities in its ballistic missile program might be eventually evolved for such a purpose. North Korea has exhibited the capability to jam civilian GPS signals within a limited geographical area. Their capability against US military GPS signals is not known. There has been no demonstrated ability of North Korea to interfere with satellite communications, although their technical capability remains unknown.

12 — SOUTH KOREA

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	–	–	–	●
MEO/GEO Direct Ascent	–	–	–	●
LEO Co-Orbital	–	–	–	●
MEO/GEO Co-Orbital	–	–	–	●
Directed Energy	?	–	–	●
Electronic Warfare	■	–	–	–
Space Situational Awareness	■	■	■	?

LEGEND: NONE ● SOME ■ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

Over the last several years, South Korea has had a growing focus on military space capabilities. It is working to enhance the space capabilities of its Air Force through the establishment of a Space Operations Center, cooperating with the United States on sharing SSA capabilities, and developing its own longer-range ballistic missiles and space launch vehicles; it also has expressed interest in developing its own reversible counterspace capabilities.

13 — THE UNITED KINGDOM

	R&D	TESTING	OPERATIONAL	USE IN CONFLICT
LEO Direct Ascent	–	–	–	●
MEO/GEO Direct Ascent	–	–	–	●
LEO Co-Orbital	–	–	–	●
MEO/GEO Co-Orbital	–	–	–	●
Directed Energy	–	–	–	●
Electronic Warfare	–	–	–	–
Space Situational Awareness	■	■	■	?

LEGEND: NONE ● SOME ■ SIGNIFICANT ▲ UNCERTAIN ? NO DATA –

The United Kingdom has long played a supporting role in military space activities through its participation in NATO and its bilateral relationship with the United States. Over the past few years, the United Kingdom has begun to add additional elements to increase its indigenous military space capabilities, primarily in SSA and policy, organization, and doctrine. To date, the United Kingdom has not publicly announced any specific plans to develop offensive counterspace capabilities.

14 — CYBER CAPABILITIES

Multiple countries possess cyber capabilities that could be used against space systems; however, actual evidence of cyber attacks in the public domain is limited. The United States, Russia, China, North Korea, Israel and Iran have all demonstrated the ability and willingness to engage in offensive cyber attacks against non-space targets. Additionally, a growing number of non-state actors are actively probing commercial satellite systems and discovering cyber vulnerabilities that are similar to those found in non-space systems. This indicates that manufacturers and developers of space systems may not yet have reached the same level of cyber hardness as other sectors. But to date, there have only been a few publicly-disclosed cyber attacks directly targeting space systems and nearly all have gone after the end user segment and not satellites themselves. The largest was a cyber attack by Russia against the user segment of Viasat's commercial satellite broadband service in Europe, which coincided with the first day Russian forces entered Ukraine in February 2022.

There is a clear trend toward lower barriers to access, and widespread vulnerabilities, coupled with reliance on relatively unsecured commercial space systems, create the potential for non-state actors to carry out some counterspace cyber operations without state assistance. However, while this threat deserves attention and will likely grow in severity over the next decade, there remains a stark difference at present between the cyber attack capabilities of leading nation-states and other actors.

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