

[Weaponization and Outer Space Security](#)

Nayef Al-Rodhan - 12th March 2018



Nayef Al-Rodhan explores the evolving space security race

Space weaponization is not a new phenomenon. However, a large number of technological developments over the past few decades have led to a drastic acceleration in the destructive potential of space warfare. In 2016, the Russian Deputy Foreign Minister Sergey Ryabkov [voiced his concerns](#) about the possibility of weapons being deployed in space. His statement followed advancements in technological endeavours such as the [Prompt Global Strike program](#), a project within which the United States started developing hypersonic glide vehicles in secret in the mid-2000s.

Such hypersonic glide vehicles are different from conventional ballistic missiles in three ways. First, they have a longer range, and can travel over more than half of the Earth circumference. Second, they can approach their target from a direction opposite to the expected trajectory of a typical ballistic missile, and do so on a low altitude gliding trajectory within the atmosphere. Third, they can be extremely precise, with terminal guidance systems enabling them to strike with an accuracy of a few meters. These characteristics make such vehicles nearly impossible to detect. Though it will take many more years and billions more dollars to complete the project, upon completion such missiles could effectively decimate a country's nuclear and military arsenals in a few tens of minutes, using low-yield nuclear weapons or even conventional explosives. During the Cold War, Russia and the US avoided serious nuclear escalations because the involved weapons on both sides could inflict severe damage on the entire world. However, the precision of hypersonic weapons eradicates this deterrent. Russia has already responded by creating the [Aerospace Defence Forces](#) in 2015, tasked with protecting the country against the Prompt Global Strike.

As other countries start to consider the US's weaponization programmes threatening – the US military space budget is [estimated at \\$25 billion](#) and possibly even at more than \$40billion – they are taking steps to defend themselves. Hypersonic missiles rely on satellites to function properly and for this reason both Russia and China are increasingly [developing the capacity](#) to destroy US satellites. Destroying a satellite could render the US military both blind and deaf, subsequently obscuring the precise targeting capabilities of hypersonic missiles for moving targets, which require a steady stream of data.

Given these latest developments, the need for the establishment and maintenance of space as a [global commons](#) is critical to global peace and security. Here, it is necessary to distinguish between using space for military purposes (such as using satellites to guide the military or collect intelligence) and the physical placing of weapons in space to target locations or objects on Earth and in space. The

problem with the latter is that there is no globally agreed upon definition of what space weapons are. Most space technology has multiple purposes, making it harder to monitor, and complicating the issue of space weaponization and defining weapons under space law.

Space Weapons

The term 'space weapons' encompasses both weapons placed in space and those on Earth capable of targeting space assets, as well as weapons which transit in outer space. Such weapons include satellites which can fire lasers, or rockets capable of launching satellites from the Earth into the low-Earth Orbit (LEO). [France, Russia, China, the US, Ukraine, India, and Japan](#) have such capabilities, and North Korea and Iran are not far behind. As satellites are instrumental to a nation's military and its economy, demolishing them can serve the military objectives of an adversary. Most space-faring countries have their own launch capabilities and more than [50 countries](#) have their own satellites or own a large percentage of shares in a satellite. In addition, the United States, Russia, France, Germany, Italy, Japan, China, India and Israel possess their own reconnaissance satellites. Reconnaissance satellites are observation or communication satellites deployed for military or intelligence purposes.

Moreover, the United States, China, Russia, Japan, India and Israel are all investing in [hit-to-kill systems](#) to be used for anti-satellite (ASAT) or missile defence. The ASAT capacities of major space powers are already known. China was involved in the most [high-profile incident of ASAT](#) testing in 2007, when it used a missile to blow up one of its own defunct weather satellites in LEO. China has also made significant progress in developing anti-ballistic missiles (ABM) which like ASATs can also be used to target other state's intelligence, surveillance and reconnaissance satellites. Both the US and Russia have also [successfully tested anti-satellite weaponry](#) – the US taking down a low-orbit defunct satellite in 2008 and the Russians completing a flight test of the A-235 Nudol direct ascent anti-satellite missile. North Korea recently joined the race, launching its own satellite into space. Iran will also be on the way to improving its ASAT capabilities, if it follows through on the [2013 announcement](#) that it is setting up a facility to track orbiting objects. Indeed, any progressions made into launching rockets into space are directly relevant to increasing a nation's capability of firing ballistic and intercontinental missiles.

There are currently several types of known space weapons and others are being invented all the time, often secretly. Scientists have already developed directed-energy weapons, such as laser and particle beams to blast energy at targets and make them inoperant. Lasers are a cost-effective method for addressing smaller threats, such as shooting down drones or stopping small ships. Lasers also decrease collateral damage, as they are very precise. Ongoing projects include that of the Defence Advanced Research Projects Agency, which is working on a weapon which will shoot molten metal, with the help of electromagnets – known as [Magneto Hydrodynamic Explosive Munition](#) (MAHEM). MAHEM can be attached to a missile and has greater control and destructiveness in hitting targets compared to existing weapons. Often militaries outsource the production of these weapons to private security firms such as [Lockheed Martin](#), which between 2014 and 2015 conducted 60 “successful tests of a laser turret on a business jet”, in addition to successful tests of laser weapons on the ground. Other examples of laser weapons include: [airborne lasers](#) (attached to Boeing 747-400 aircraft); [Active Denial](#) Technology (millimetre-wave electromagnetic waves that are not lethal but efficient in deterring adversaries by heating their skin

without severe pain); and the US Army's [Tactical High Energy Laser \(THEL\)](#), which shoots enough energy at flying rocket warheads to cause them to detonate.

Legal frameworks

The [Outer Space Treaty of 1967](#), established nearly a half a century ago, remains the basic guidelines of international space law, and the most important among the [UN's 5 major space treaties](#). However, the treaty does not prohibit the stationing of weapons in space or ASAT weapons. In fact, the development of space technologies has always been [linked to military strength](#), especially at the time when the Outer Space Treaty was signed. The unwillingness of the signatory parties to develop their space capacities exclusively for "[peaceful purposes](#)", as stipulated in the treaty, has set a precedent for accepting militarised space use, which continues today.

In 2000, the UN adopted a resolution on the "Prevention of an Outer Space Arms Race which re-emphasized the importance of using space for peaceful purposes, the importance of avoiding an arms race and "the readiness of all states to contribute to that common objective, in conformity with the provisions of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies" ([Annex III](#)). [The Anti-Ballistic Missile \(ABM\) Treaty](#), signed in 1972, reduced the number of ABM deployment areas down to one, constituting an important step in disarmament. However, in 2002 the US formally withdrew from the treaty, damaging international security and disarmament trends. [The next day](#), the Kremlin announced that it would no longer abide by the second Strategic Arms Reduction Treaty ([START II](#)), signed in 1993, which established a limit on strategic weapons such as nuclear warheads, submarine-launched ballistic missiles and heavy intercontinental ballistic missiles.

There are several other treaties and numerous non-binding resolutions on the topic of space security. Some examples include the 1968 Agreement on the Return of Astronauts, the 1972 Convention on the International Liability for Damage Caused by Space Objects and the 1975 Convention on Registration of Objects Launched into Outer Space. However, there are several looming issues. For example, there is no agreement between states on dealing with the ever increasing amount of space debris or how to distribute liability for generating space debris which damages another state's space assets. A [document](#) on "Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space" was endorsed in 2007 by the General Assembly. It contains recommendations on how states should implement measures on debris mitigation. In 2014, the United Nations Office for Outer Space Affairs (UNOOSA) convened a [compendium of space debris mitigation standards](#), and in 2011 the UN also made efforts to foster [transparency and confidence-building](#) in outer space activity. However such measures still have a long way to go prior to becoming legally binding.

The exportation of space technology is often classified information, making market competition more difficult. Trade treaties focusing on the simplification of trading in satellite or other space technologies would increase transparency and foster cooperation. A potential progression could come from a group of legal experts carrying out a three-year project with the aim of creating a [Manual on International Law Applicable to Military Use of Outer Space \(MILAMOS\)](#).

Yet for the time being there is a clear [absence of a comprehensive international legal framework](#) which can effectively restrict countries from weaponization. This legal void is in fact

contributing to an unstable and unsecure space environment. Unfortunately, geopolitical realities represent a constraint to progress in international rules and regulations, and have consistently blocked the implementation of a [Code of Conduct for Outer Space Activities](#), proposed by the EU in 2008. The dominance and strategic dependence of the US on space assets for military purpose has fostered an [uneven and tense playing field](#), in which its rivals seek to catch up in terms of weaponization and the US seeks to maintain its dominance.

Going forward: Recommendations

The first and most important step towards securing space security would be, of course, to ban the deployment and testing of weapons in space. However, states have difficulty resisting investments in new technologies that promise advanced capabilities. As a consequence, discouraging them may prove to be an unrealistic endeavour. For instance, some argue that kinetic technologies are developed for scientific purposes. However, states which can afford to develop this technology will most likely also seek to master the associated advanced military capabilities, at the very least in order to understand how to defend against it.

Nevertheless, a scenario of escalation cannot be ruled out. Such testing should thus be banned, as it is more likely to transform crises into war than to act purely as deterrence to developing weapons. The marginal utility of weapons testing does not offset the extreme risks that come with their existence. They enable the swift destruction of low-orbit satellites, which many states with developed space programs (not to mention private companies) now possess, which could easily provoke retaliation and escalation with the potential to quickly spiral out of control. At the same time, state leaders must understand the importance of not resorting to threats of attacking space objects. Society is reliant on space for day-to-day services, and the implications of any attacks would be severe. Even the threat of an attack can be destructive, as an adversary may seek to protect itself with a pre-emptive attack.

It is vital to use the technology we have to support peace, not threaten it. Technological developments in space help ensure terrestrial security. Global communications systems allow for instant communications and satellites, providing valuable geological and meteorological information. These capabilities could also [facilitate disarmament treaties](#), as information about compliance is more easily gathered and exchanged. Finally, in order to increase situational awareness of space objects already in space, as well as their purposes, states should submit valid information to international institutions which can then organize the data and provide open-source information to all about the situation in space.

Ultimately, a simple yet compelling [principle](#) must guide space security and inter-state relations down here on Earth: space is either safe for all or for no one. Given the interconnected nature of space affairs, the heavy reliance on space assets and the critical role of outer space both for civilian and military purposes, a carefully managed, well regulated and cooperative framework is indispensable moving forward. Some limited competition and egoistic behaviour cannot be ruled out, but they must be well-balanced with a commitment to keeping outer space safe. This apparent tension between competition and collaboration can be managed in a framework of [Symbiotic Realism](#) – a theory of International Relations that emphasizes the egoistic, Realist features of global politics, where anarchy remains an undisputed fact, but simultaneously accounts for the interdependences created by globalization. Had states relied this heavily on outer space in the

19th century and in the first decades of the 20th century, we could have expected states to apply classical balance-of-power thinking in their management of space weapons. Today, however, that is not only more difficult, but almost self-harming as the nature and complexity of interdependencies on Earth require a more symbiotic approach to space affairs too.

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