Briefing Paper

Committee: DISEC

Topic: The Question of the Weaponisation of Outer Space

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Summary

In the 70 years since the advent of the space age, the world as we know it has become increasingly dependent on satellites and the connectivity they provide for everything from communication and navigation to banking, shopping, and leisure. Military operations have been no different, relying on satellites for navigation, reconnaissance, and communication. However, this has meant that satellites are increasingly seen as potential targets for countries wishing to degrade the capabilities of other militaries in times of war.

While this may initially seem like part and parcel of warfare in the modern era, it has considerably greater ramifications than traditional forms of combat, as the destruction of satellites creates large amounts of space debris, which can very easily damage civilian satellites essential for the daily lives of many.

It is also worth noting that while attacking satellites is the main way in which space can currently be used for military purposes, other methods have been proposed, most notably space to earth weapons.

Space-based military operations can broadly be organised into three categories:

1. Non-weaponised satellites,
2. Space as an area to deploy weapons,
3. Space as a battlefield.

The first usage (for non-weaponised satellites) is typically for purposes like GPS, communications, or imagery. While these are not weaponised, i.e. they have no offensive capabilities, they are used widely by most notable military forces, as the predominant method of long-distance communication, for photographic reconnaissance, and for navigation. These are also most likely to be targeted by hostile forces, in an attempt to disrupt the operations of the militaries using them, or simply as part of a “cost imposition” strategy, whereby a conflict is made too expensive for a nation to continue, forcing them to withdraw.

The second usage of space is as an area to deploy weapons, both to be transited through, i.e. by Inter-Continental Ballistic Missiles (ICBMs), or to have weapons systems prepositioned in it, i.e. space to space weapons, or orbital strike weapons (weapons systems orbiting the earth capable

of attacking targets on the ground). This is used extensively by most ICBMs, which employ trajectories through the edge of space to avoid air resistance and increase range.

The third form of military usage of space is as a battlefield in which to fight opposing forces. Science Fiction tends to visualise this simply as a conventional conflict, but in space, with astronauts, rather than soldiers, using traditional military tactics against each other (guns, etc.). However, in reality, space warfare would be more likely to use unmanned weapon systems in orbit, and involve seeking to disable enemy satellites in order to disrupt ground activities.

Definition of Key Terms

Weaponisation – the placement and/or use of weapons in a given area (i.e. outside earth's atmosphere)

Outer Space – all areas outside the earth's atmosphere, above the Karman Line. This cannot be properly categorised into the airspace / jurisdiction of different countries, making it extremely difficult to regulate without unanimous support & goodwill.

Karman Line – Theoretical line generally placed 100km above sea level (Though most US organisations use 80km). The boundary between the atmosphere and space.

Space to space weapons – weapons outside the atmosphere targeting other objects in space (manned spacecraft, satellites, etc.). Weaponry of this kind has only been used once.

Space to earth weapons / Orbital Strike Weapons – weapons systems placed in orbit to attack targets on the surface of earth. Plans for these have been considered and investigated many times, most notably Kinetic Orbital Weapons, whereby heavy rods in orbit are deorbited onto collision courses with their targets. They can then accelerate to speeds upwards of Mach 10 as they fall, impacting with the energy of a small nuclear bomb.

Earth to Space weapons – any weapons based on the ground or in the atmosphere of earth capable of attacking objects in space. While early forms of these consisted mainly of co-orbital interceptors (satellites placed on a similar orbit and designed to collide with the target), these now almost exclusively take the form of direct-ascent Anti-Satellite missiles (ASATs).

Background Information

Space exploration, like many other technologies (e.g. duct tape, jet engines and the internet) has been heavily linked to military activities since it's advent, indeed the rocket that took the first ever human into space was derived from the first ever Inter-Continental Ballistic Missile (ICBM).

However, while linked to military technologies in its development, the realm of space has generally been regarded as a sanctuary for scientific progress free from the hostilities of terrestrial conflicts, (one need look no further than the Internation Space Station (ISS), which has been one of the few areas of collaboration between Russia and the west following the Cold War era). However, in today's highly globalised world, space has evolved beyond just a realm of

scientific exploration to become a critical domain for economic activities. With over 80 countries owning or operating satellites and a burgeoning space economy, the continued security and stability of space is more important than ever before. This is highlighted by the exponential growth in the number of active satellites in orbit, having climbed from around 1,300 in 2015, to well past 12,000 as of late 2025, with some projections estimating that this could rise as high as 100,000 in the next ten years.

This growing dependence on satellites in the civilian world has been mirrored by military forces, whose increasing use of satellites for communication, navigation, reconnaissance, and surveillance has made them prime (and comparatively undefended) targets in potential conflicts. Recognizing this vulnerability, many countries are investing in technologies, particularly ASATs, that could protect their assets in space and, if necessary, disrupt those of their opponents.

Placing weapons in space is both extremely expensive and time consuming, hence why it is not yet a common occurrence, however the rapid decrease in the costs associated with launching objects into orbit is beginning to make the orbital weapons that were once seen as a product of Cold War military hysteria seem economically feasible. Similarly, the increasing mass commercialisation of satellites would likely aid much smaller nations, who would never previously have been able to develop a space programme to rapidly advance military operations in space.

The use of weapons in space like ASATs in a conflict could lead to irreversible consequences, as single strike could disable critical systems, blind surveillance networks, or disrupt early warning capabilities. The risks surrounding this are increased due to the rapid decision making and limited information availability necessitated by operations in space.

The Problem of Space Debris

One of the most pressing issues linked to space weapons is orbital debris. When an object in space is destroyed, it fragments into hundreds or thousands of pieces. These fragments can remain in orbit for years or decades, posing collision risks to satellites and even manned space stations like the ISS. Even small pieces of debris traveling at orbital speeds can cause considerable damage.

This is particularly an issue due to an effect known as Kessler Syndrome, whereby every destruction creates more debris, creating more collisions, releasing more debris, in an exponential spiral. It is theorised that there could be a point where the cascading effect of enough collisions creates so many pieces of debris that some orbits of the earth could become entirely unusable for generations.

While this can and does occur normally due to accidental collisions between satellites, it is accelerated massively by purposeful destructions of satellites, predominantly by ASAT (anti-satellite) missiles, which create far greater amounts of debris due to their intentionally destructive nature. This creates significant issues, as any attempts to police or defend space with military force can vastly increase the risks associated for all users of space, both military and civilian.

Major Countries and Organizations Involved

Russia – The first country to successfully destroy a satellite in orbit, using a co-orbital interceptor launched like a conventional satellite in 1971. Also, the only country known to have built or used space to space weaponry (having reportedly destroyed a target satellite with a cannon fired from the Salyut 3 space station in 1974, as part of the USSR's "Almaz" military space station programme). Have since demonstrated ground launched ASAT capabilities.

USA – One of the pioneers of reconnaissance and navigation satellite systems, they were also the first country to perform test a direct-ascent ASAT missile, destroying a satellite with a missile launched from an F-15 fighter jet in 1985, and possess significant ground-based ASAT capabilities. Pioneered the use of satellites for military reconnaissance and navigation. Currently operate the largest fleet of satellites of any country, owning around 30% of the world's military satellites, and around 50% of all satellites. They have historically had a fairly negative stance on complete bans of weapons in space, supporting only bans of Weapons of Mass Destruction (WMDs).

China – Conducted a highly controversial kinetic ASAT test in 2007, destroying its own weather satellite and creating thousands of pieces of orbital debris. Continues to rapidly develop its space capabilities, including technologies with potential counterspace applications.

India – The fourth country to have proven ASAT capabilities, having destroyed one of its own satellites with a ground-based missile in 2019.

Other nations – Many other nations have military satellites, and of those quite a few, like Israel, Japan and Germany (amongst others) have advanced missile systems (often bought from the US) that could theoretically be used in ASAT roles should the need arise, though these countries are not known to have tested this capability.

Timeline of Events (Relevant UN Treaties)

1963 – Partial Test Ban Treaty (PTBT): banned nuclear testing in outer space, in the atmosphere and underwater (everywhere except underground). Unanimously followed since 1980.

1967 – Outer Space Treaty: Limits use of outer space to peaceful purposes only, bans the placing of weapons of mass destruction (e.g. nuclear weapons) in space, however it does not explicitly ban conventional weapons in space if they are not on celestial bodies. Ratified by all countries with a notable space program, except North Korea.

1979 – Moon Agreement: Designates the Moon and other celestial bodies exclusively for peaceful purposes, prohibiting military activities. However, it has limited ratification and is not widely accepted by major spacefaring nations.

Previous Attempts to Solve the Issue

Over the past 40 years, numerous (less than successful) attempts have been made to address the complex challenges posed by the weaponisation of outer space, ranging from international treaties and resolutions to codes of conduct and unilateral moratoriums.

- **Prevention of an Arms Race in Outer Space (PAROS) Resolution**s: The UN General Assembly has consistently passed PAROS resolutions since 1981, calling for negotiations on a legally binding instrument to prevent an arms race in outer space. The Conference on Disarmament (CD) in Geneva has been the primary forum for discussing PAROS. However, due to disagreements on its mandate and programme of work (particularly the definition of "space weapons" and the inclusion of verification measures), substantive negotiations on a new treaty have not advanced.
- **Treaty on the Prevention of the Placement of Weapons in Outer Space, and of the Threat or Use of Force Against Outer Space Objects (PPWT)**: Proposed by Russia and China several times since 2008 within the Conference on Disarmament, prohibiting the placement of all weapons in outer space and the threat (or use) of force against space objects. Critics (primarily the U.S. and allies) have concerns about its verifiability, differentiation of military Vs civilian space technologies, and its failure to address the threat of ground-based anti-satellite (ASAT) capabilities.
- **Transparency and Confidence-Building Measures (TCBMs) in Outer Space Activities**: Recognizing the difficulties in reaching a comprehensive treaty, many countries have advocated for non-binding TCBMs to reduce mistrust and miscalculation.
    - UN Group of Governmental Experts (GGE) on TCBMs (2014-2018): This group successfully developed a report outlining a range of voluntary measures, such as data exchange on space objects, notifications of space launches, visits to space facilities, and discussions on definitions, in order to build co-operation & collaboration.
- **EU Code of Conduct for Outer Space Activities**: From 2008 onwards, the European Union initiated efforts to develop an international, voluntary, and politically binding Code of Conduct for Outer Space Activities. The aim is to establish basic rules for responsible behaviour in space, including measures to enhance safety, security, and sustainability, while avoiding the placement of weapons. While widely discussed, it has not yet achieved universal adoption.
- **Prohibitions on destructive Direct-Ascent ASAT Missile Testing**: In April 2022, the United States announced a self-imposed ban on destructive direct-ascent ASAT missile testing, calling on other nations to follow suit. The move was intended to establish a new international norm and reduce the creation of space debris. Canada, New Zealand, Japan, Germany, and the United Kingdom have since joined this commitment.
- **"No First Placement" Pledges** (Russia and China): Russia and China have repeatedly stated that they will not be the first to place weapons in outer space.

Possible Solutions

Mutually Assured Destruction

In a comparable manner to nuclear weapons during the cold war, if enough nations develop sufficient ASAT technologies, a common consensus could be established where no nation wants to be the first to attack satellites, for fear of retaliation. However there is a notable difference with satellites, as Mutual Destruction is possible not only due to the significant capabilities of two opposing sides destroying the satellites, but also due to the Kessler effect, whereby an unknown number of destructive events will lead to the cascading destruction of all satellites in a similar orbit. While this has certainly been an effective strategy in preventing nuclear apocalypse, it is by no means perfect.

Regulation

A significant hurdle in all negotiations is the lack of a universally agreed-upon definitions of vague terms like "space weapon", especially given that many seemingly benign technologies (like rendezvous and proximity operations, or even communication jammers) can easily be repurposed for military applications in the challenging environment of space.

International Cooperation and Arms Control

Promoting global norms of responsible behaviour in space and establishing international treaties to prevent and limit the spread of weapons in and relating to outer space is as important prevent an arms race in outer space is an essential element of making this form of deterrence work. This includes discussions on verifiable limitations on ASAT testing, definitions of what constitutes a space weapon, and enhanced transparency measures for space activities.

Useful Links

1. Center for Arms Control and Non-Proliferation. "Fact Sheet: Space Weapons."
2. The New Space Economy. "The Paradox of Space Weapons."
3. UN Office for Disarmament Affairs (UNODA). "Outer Space"
4. Arms Control Association. "Outer Space Treaty (1967) at a glance"
5. Secure World Foundation. Official website.

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1. European Parliament. "Resolution on the EU space strategy for security and defence."
2. Patrick Morgan, Cambridge University Press. "Deterrence Now".
3. Scientific Library. "Salyut Programme"
4. Russian Ministry of Foreign Affairs. "Statement on no first placement." (note – English translation provided on second page)
5. Cambridge Dictionary. "weaponisation – definition"
6. Secure World Foundation. "Global Counterspace Capabilities Report."

7. SlashGear. "America's Cold War Secret: Exploring the 'Rods from God' concept"
8. The New Space Economy. "The Paradox of Space Weapons."
9. Secure World Foundation. "UN Group of Governmental Experts on space TCBMs Fact Sheet"
10. Nuclear Threat Initiative. "PAROS Treaty"
11. United Nations Office for Outer Space Affairs (UNOOSA). "Roles and Responsibilities."
12. World Population Review. "Military Satellites by country 2025"
13. FutureTimeline.net. "Launch costs to Low Earth Orbit, 1980-2100"