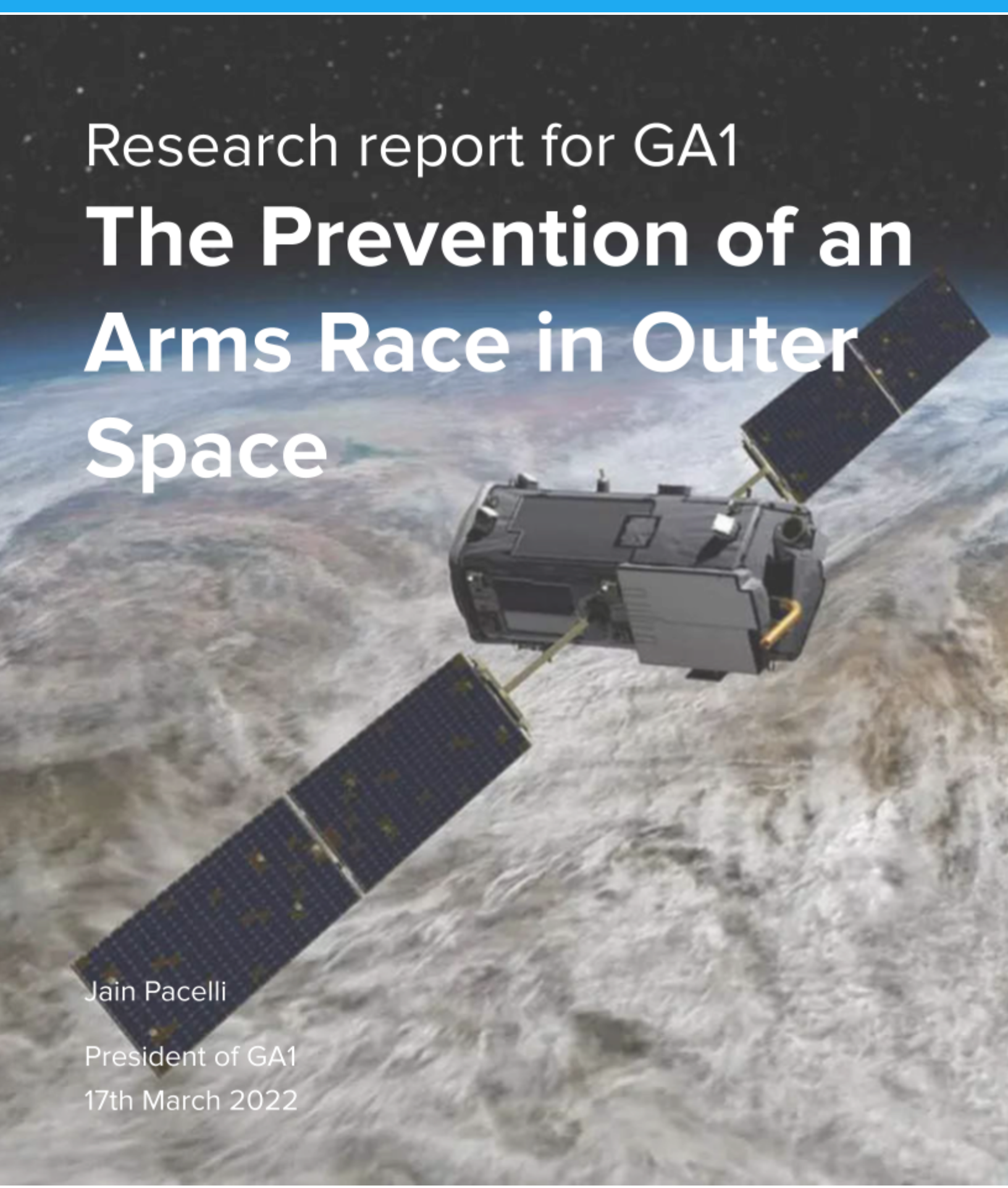
Research report for GA1

The Prevention of an Arms Race in Outer Space



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Introduction

Mankind has been fascinated with the idea of space exploration since the beginning of time. In the later portion of the 20th century, the development of rockets paved the way for space exploration and opened new pathways to militarization and defense. The push for technological progression into space began during the Cold War, which started in 1947 the two global superpowers at the time, the US and the USSR were competing to develop missiles, nuclear weapons, and space technology. In 1957 the first artificial satellite, Sputnik, was launched by the Union of Soviet Socialist Republics (U.S.S.R.) with the intent of orbiting the earth, with the first US satellite being launched a year later. The launching of these satellites initiated the space race between the U.S and the Soviet Union. Since then various countries have constructed and launched military satellites that they now depend on and use for command, control, communication, early warning systems, and navigation within the Global Positioning System.

With rising global political tensions being witnessed, it is important for member states to come to a further agreement to ban the high potential of an outer space arms race or full conflict. The issues to be addressed are how states can prevent further weaponization, particularly of nuclear weapons and missiles as these will undermine national and international security by destroying the strategic balance and stability of the global stage, in turn, inevitably leading to an Arms Race in Outer Space.

Key terms

Anti Satellite weapons (ASAT)
Space weapons designed to incapacitate or destroy satellites for strategic and tactical purposes. Their roles include defensive measures against adversary space based and nuclear weapons, force multipliers for a nuclear first strike, countermeasures against anti-ballistic missile defense, and an asymmetric counter to a technologically superior opponent as well as a counter value weapon. When deployed they generate a large amount of space debris.

Direct Energy Weapons (DEWs)
Direct energy weapons such as lasers, Active denial systems, counter-electronics high power microwave advanced missile project, and long range acoustic devices.

Kinetic Kill Energy Weapons (KEW)
A term used in the military aerospace field to describe weapons that destruct by hitting the intended target at a high velocity and do not contain an explosive warhead.

Anti ballistic missiles (ABM)
A surface to air missile defense designed to counter ballistic missiles.

Ballistic missiles
Used to deliver nuclear, chemical, biological, or conventional warheads in a ballistic flight trajectory. In this case used for the purpose of attacking satellites.

Hard Kill space weapons
Weapons that cause direct damage through impact such as Kinetic energy weapons.

Soft-kill space weapons
Less physically damaging weapons that Include electronic warfare measurements such as jamming technologies.

Railguns
Linear motor device typically designed as a weapon that used electromagnetic force to launch high velocity projectiles. The projectiles do not contain explosives and instead rely on the high speed, mass, and kinetic energy of the projectile to cause the most damage.

Space Based Positioning Systems (SBPS)
SBPS receivers can determine the position of any object existing on earth by trilaterations of microwave signals taken from satellites moving in the orbit of the earth.

Kessler Syndrome
A phenomenon that occurs when the amount of space debris in orbit around the earth reaches a point where it will create more space debris from collisions of the objects in turn causing large issues for satellites to orbit, astronauts, and mission planners.

General Overview

Warfare systems

During the mid 1980s there were various systems proposed for space warfare that ranged from the more realistic measures seen today such as ground and space-based missiles, to the more extreme end with the proposal of railguns, space based lasers, and orbital mines. Under the banner of Strategic Defence Initiative announced by Ronald Reagan in 1983 the concern for the future development of these weapons was made and if the Cold War continued many of these space weaponry systems could have potentially been deployed. The United states had developed working railguns, and lasers that had the power to destroy missiles at ranger although impracticalities were made apparents due to the power requirements, firing cycles, and range. Furthermore, weapons such as the space-based laser were rejected not only by governments but by universities and moral thinkers due to the inevitability of it increasing the waging of the arms race.

Current military operations in space focus on the vast tactical advantages of satellite-based surveillance, positioning systems, communications, or mechanisms that will take away the aforementioned tactical advantages from another state. Most of the passed resolutions and proposals focus on what is traditionally defined as a weapon such as missiles and weaponized satellites but do not fully take into account the electronic weaponry that is designed to jam and sabotage enemy satellites while protecting states own satellites or their allies. An example is the research that has been conducted by the United States on microsats and picosats that are nimble enough to maneuver around orbiting objects, repair, sabotage, hijack, or collide with them causing damage.

Once again due to the minimal scope of the various passed treaties in terms of what weapons are regulated, Kinetic bombardment is a concept which the United States explored wherein orbiting magazines of non-explosive projectiles could be dropped onto targets from a low earth orbit. Kinetic weapons have been a widespread form of conventional warfare, and would cause a tremendous amount of damage without the need for nuclear weapons. Directed energy weapons are another weapons system that could present a danger to the prevention of an arms race in outer space. These weapons can include lasers, linear particle accelerators, or particle beam based weaponry. While the idea seems far fetched from a sci-fi movie, Nazi germany had a project and began construction for such a weapon called the wunderwaffe which would have been an orbital concave mirror able to concentrate the suns energy onto a ground target.

Considering that technological advancements have been made since then, the possibility of member states developing such weaponry is not all that unlikely.

Space Debris

Another concern regarding anti-satellite attacks or tests, particularly involving kinetic kill vehicles due to the large impact they can have can contribute to the formation of space debris, which could possibly result in a Kessler syndrome/effect. The 2007 satellite knock out demonstrated by China demonstrated this destruction by causing more than 40,000 new pieces of debris.

Recent Developments

In 2020 the Russian Federation conducted an anti-satellite test of its direct-assent missile system, with the US responding by stating that this posed a threat to US interests. After further activity between the US and Russia, the First Committee of the UN General Assembly voted in favor of adopting five resolutions on outer space security for the "Prevention of an arms race in outer space" on November 6th, with opposition by the Russian Federation that was outvoted. In 2021 France conducted its first outer space military exercise named "AsterX" with the purpose of being conducted as a "stress test" of French defenses against Anti-Satellite weapons (ASAT) weapons fire and other threats.

Major parties involved:

United States

As aforementioned, the US became one of the leading nations in initiating a space race during the Cold War with the Soviet Union, since then they have continued to develop its Satellite technology and organized their Space Force in December of 2019. Discussions in the US in regards to a space arms race are focused on increasing security by developing a space-based sensor system like the Proliferate Low Earth orbital constellations (PLEO), as well as building intelligence in space-based ballistic interception function, and building directed energy weapons for missile interception. In the June 2020 US Defense Space Strategy China and Russia were outlined as the largest operational threats to the USk, and are pointed out to be parties that have weaponized space and turned it into an area of competition.

Russian Federation

In 2020 representatives of the Russian Federation and the United States met in a “Space Security Exchange” conducted under the framework of a Strategic Security Dialogue which was the first engagement on the topic in the last 7 years. It followed Russia conducting a “non-destructive test of a space-based anti-satellite weapon” by releasing a projectile into orbit. The US responded by saying that the test demonstrated “Russia's hypocritical advocacy of outer space arms control”.While it is not certain if Russia's actions were to cause the US to become defensive, it is evident that they have been testing various satellite launched anti-satellite missile systems.

China

Since 2007 China has been active in carrying out anti-satellite destruction tests using anti-satellite weapons to trigger the development of turning space into a fighting domain. In response to the conflict in Taiwan China has been increasing its cyberspace and outer space capabilities. The 2007 test was met with tremendous backlash from various actors, which was unprecedented even in the Cold War Era. Experts have analyzed that China has been pursuing a strategy of asymmetric warfare which has posed a threat to the United States in reckoning the vulnerability of its own space systems.

India

India's primary rival in the military arena of space is China due to the advancement it has in terms of expansive and diverse capabilities. KEWs are currently not a part of India's space program but should look to be implemented as they would be critical instruments

for asymmetric escalations, To bridge the gap between China and India, INCOSPAR (Indian Space Research Organization) would need to implement a more diversified kinetic capabilities combined with a space borne direct energy weapons (DEW).

Japan

Since the establishment of the Japanese Aerospace Exploration Agency (JAXA) 2003 Japan has been developing a multi-layered Ballistic Missile Defense (BMD) system by equipping Aegis ships with ballistic missile response capabilities and deploying missiles. However recently the government announced they would no longer deploy the two land-based Aegis Ashore systems that were intended for the protection of the state.

NATO

In November of 2019, NATO declared space as an operational domain, for the purpose of helping to ensure a coherent approach to the integration of space into NATO's overall deterrence and defensive position, as well as to ideally prevent an arms race.

Passed Treaties and Resolutions

The possibility of an Arms race in outer space has been a consistent concern to an overwhelming number of UN members since the Cold War. Due to the heavy reliance states have on the presence of satellites in orbit, protecting these assets will heavily motivate nations that are dependent on them to consider deploying more space-based weaponry, especially in conflicts that involve countries with access to space based weaponry such as the Russian Federation. In 1959 the UN general assembly established the Committee on the Peaceful Uses of Outer Space (COPUOS) with the purpose of identifying areas for international cooperation in maintaining peace in the uses of outer space, and devised programs that would be undertaken by the United Nations (NTI). During the 60s and 70s, various resolutions were adopted to condemn the weaponization of outer space for the purpose of preventing a space arms race. In 1967 the UN Outer Space Treaty was passed that advocated for a ban on the weaponization of space "Calling on all states, in particular, those with major space capabilities to contribute actively to the peaceful use of outer space, prevent an arms race there, and refrain from actions contrary to the objective" with article 4 stating that "The moon and other celestial bodies shall be used by all State Parties to the Treaty exclusively for peaceful purposes" (Resolution 2222). In 1981 the UN passed a draft submitted by the Russian federation known as the PAROS Treaty (Proposed Prevention of an Arms Race in Space) that further reaffirmed the fundamental principles of the 1967 treaty and prevented any nation from placing objects carrying any form of weapons into orbit.

Unfortunately, the resolutions cannot prevent nations from placing weapons that are not of mass destruction in space, therefore many states have argued that the treaties are insufficient for safeguarding space and preventing an arms race. To address this the last documents of the UN General Assembly's Special Session on Disarmament mandated that negotiations regarding "preventing an arms race in Outer space" in relation to the accordance of the 1967 Outer Space Treaty shall take place in the Conference on Disarmament (CD). In 2008 the draft treaty submitted to the CD by the Russian Federation requested that State parties would refrain from placing objects carrying any type of weaponry into orbit, installing weapons on celestial bodies, and threatening to use force against objects in outer space, with various State parties agreeing to practice confidence-building measures.

Possible solutions

In order to address the issue of preventing an arms race in outer space, the weapons that are allowed to be placed into orbit and used must be defined, as the current definitions in the passed resolutions are too narrow to encompass the growing technology that each member state is adopting. Member states must also adhere to the passed treaties and continue to collaborate in preventing the militarization of outer space as that will inevitably lead to an arms race. Collaboration through diplomacy and managing international tensions is key to the prevention of and repetition of an arms race that could lead to potential space warfare.

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