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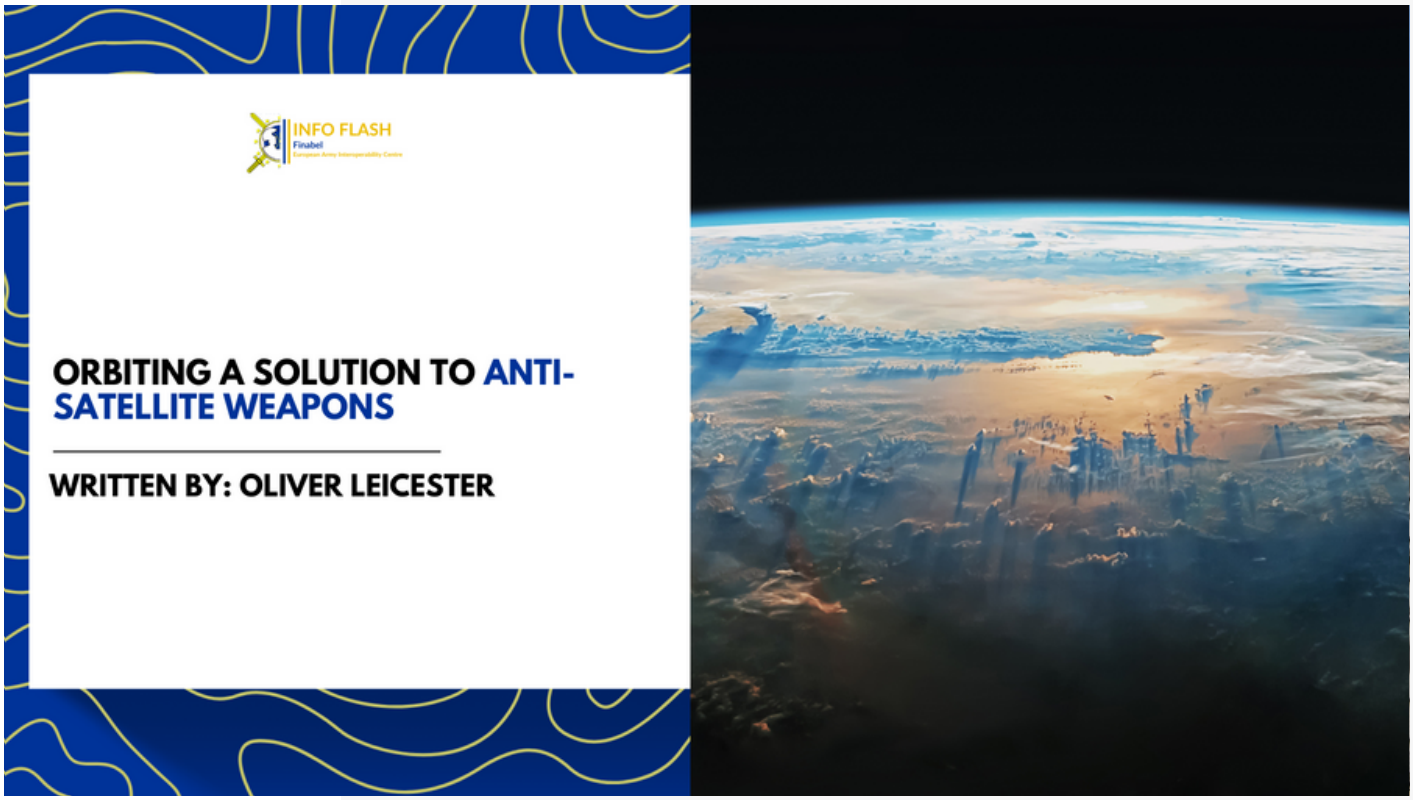

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Introduction

One of the many problems that the scientific community is facing today is space debris. Space debris is exceptionally dangerous as it can cause the Kessler Effect, a scenario where objects in space collide, creating an exponentially growing mount of rubble orbiting the planet. What is especially concerning is the use of anti-satellite weapons (ASATs), which leave hundreds of thousands of debris items in space, putting astronauts and other satellites at risk. If states continue to test their ASAT weapons or use them to attack other satellites, this could have a dramatic impact on all space actors as well as future generations. This study will explore why the international community has not banned the use of ASATs yet and it will investigate how to achieve this outcome through an in-depth analysis of space-related treaties.

The Kessler Effect

Debris is one of the most significant issues affecting the future use of outer space. In the 1970s, Donald J. Kessler suggested that there is a maximum safe amount of space debris which can exist in Low Earth Orbit (LEO). Once the overall number of rubble in LEO reaches that specific level, it will trigger a cascading effect where collisions between objects create exponentially more debris (Santamaria 2022, para.1 and Lutkevich 2020, para. 2). This outcome is called the Kessler Effect or Kessler Syndrome. This scenario would create a considerable risk for the continued use of space, particularly in LEO, "as the likelihood of collisions between high-speed pieces of debris and satellites or space operations would increase dramatically" (Lutkevich 2020, para. 3). In essence, the Kessler Effect serves as a warning that debris in space can create a domino effect which endangers any future use of space.

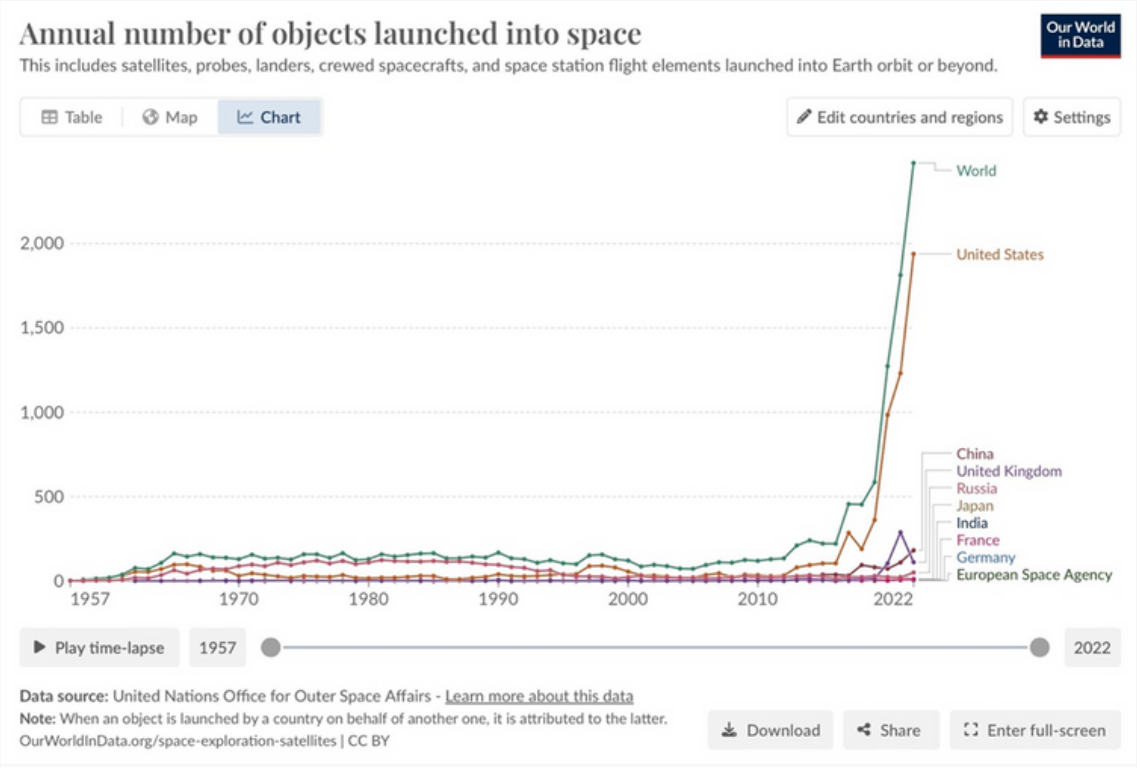

Figure 1. Annual number of objects launched into space, Our World in Data 2023, Date [Source: Link to image]

As a result, space traffic is a topic of serious concern for scientific bodies internationally (Delgado 2023, para. 4 and Impey 2023, para. 15). Figure 1 shows that since 2018, the number of objects launched into space has increased exponentially from roughly 450 to 2,400 globally each year. This growth can be partially explained by Space X's Starlink programme which, according to Article VIII of the 1967 Outer Space Treaty, is under US jurisdiction. Space X's Starlink programme accounts for 50% of active satellites currently in orbit (McKinsey 2023 para. 5), and as more satellites are launched into orbit, the likelihood of collisions also increases. This leads many in the scientific community to worry that space traffic and space debris will create far greater issues down the line (Delgado 2023, para. 4 and Impey 2023, para. 15).

Anti-Satellite Weapons

As discussed, the threat of accidental satellite collisions concerns scientists and experts globally (Delgado 2023, para. 4 and Impey 2023, para. 15). Equally worrying for the international community is the development, testing and maintenance of brute force ASATs. These weapons can create vast amounts of space debris which could lead directly to the cascading effect described by Kessler. In November 2021, the Russian Federation tested an ASAT missile, a PL19 Nudol, on one of their "now-defunct Soviet-era COSMOS 1408" (Panda 2021, para. 2), making it the third test of its kind since 2007 (Panda 2021, para. 2). Russia's test in 2021 was responsible for a "massive debris field" in LEO according to the US Space Command (Dickinson 2021, para. 1). In fact, this test created 1,500 trackable pieces of debris and likely hundreds of thousands of smaller pieces (Dickinson 2021, para. 1), highlighting the unsustainability of such experiments.

ASATs can be divided into two types: weapons that destroy satellites with brute force and weapons that do not do so. Brute force satellites either hit the satellite directly or can explode close enough to the satellite to cause it damage (Smith 2022, para. 7). ASATs like this can be any object capable of reaching the necessary altitude e.g., drones, missiles, or other satellites (Smith 2022, para. 7). Direct-ascent ASATs can strike objects by predicting their trajectory; therefore, they are not necessarily required to enter orbit. In contrast, co-orbital satellites are launched into orbit, where they manoeuvre to the target before striking (Satnews 2022, p. 3; Way 2022, para. 4). Hence, co-orbital satellites can be launched into space years before they are activated (Satnews 2022, p. 3; Way 2022, para. 4).

Non-brute force ASAT weapons are designed to shut down or damage the function of a satellite without creating space debris. Of course, this still leaves the satellite in orbit and sometimes unable to manoeuvre around other objects to avoid collisions. However, this is a far safer and more sustainable alternative to the previously discussed brute-force ASATs. Non-brute force ASATs use a range of techniques to immobilise satellites: for example, high-powered lasers can be targeted to blind their optical functions, that is their ability to collect visual data (Way 2022, para. 6). High-powered lasers can also be used to damage a satellite by overheating its parts e.g., solar panels (Way 2022, para. 6). Electronic attacks include temporary actions such as jamming the data transmitted by satellites (Way 2022, para. 8).

Moreover, exploding a nuclear weapon in space creates an electromagnetic pulse (EMP), which in turn is one of the most effective ways to disable a satellite. The EMP has an immediate impact on the functioning of the satellite in orbit, while the radiation from the attack quickly degrades its components (Way 2022, para. 5). However, the 1963 Treaty Banning Nuclear Tests in the Atmosphere, in Outer Space and Under Water (Partial Test Ban Treaty) bans the use of nuclear weapons in space. Considering the risk of collateral damage to a state's own satellites and the fact that this treaty is widely ratified, EMPs are not viewed as conventional ASAT weapons. Nonetheless, it is worth discussing EMPs as China and North Korea have not yet ratified the 1963 Treaty despite possessing nuclear weapons.

ASAT Test Ban

In December 2022, the United Nations adopted a resolution calling for countries to ban ASAT tests (Foye and Hernández 2022, para. 1). The resolution passed with 154 Members voting in favour, eight against and ten abstaining (Foye and Hernández 2022, para. 4). The resolution is not legally binding; however, it reflects a momentum shift in opposition to ASAT testing and international concerns about space debris. This resolution was championed by the US as a step to curb a space arms race (Foye and Hernández 2022, para. 4). After Russia's test in 2021, Vice President Kamala Harris announced that "developing a shared understanding of what constitutes safe and responsible space activities contributes to a more stable space environment" (Harris 2021, para. 4). This commitment protects US' national security interests and long-term space exploration interests, in space science and space-enabled economic development (Harris 2021, para. 5). Harris emphasised the US' interests in securing a test ban for ASAT weapons; yet, it is precisely the US' strategic advantage in ASAT weapons which is causing concerns to other powerful states. When opposing the resolution, Belarus, Bolivia, China, Cuba, Iran, Nicaragua, Russia, and Syria "noted that the US already possessed ASAT weapons" (Foye and Hernández 2022, para. 6).

This is a crucial factor in the debate over ASAT testing bans: in fact, the US conducted multiple ASAT tests to develop their current capabilities in ASAT technology, thus creating a considerable amount of space debris. In the 1980s, the US developed their own ASAT weapons (Kestenbaum 2007, para. 9), while as recently as 2008, during Operation Burnt Forest, the US Navy destroyed a malfunctioning satellite, producing over 150 pieces of debris (Kang 2007, para. 4). The US has conducted multiple tests on their ASAT technology involving brute force weaponry, contradicting the "safe and responsible" space activities which Harris referenced in her speech (Harris 2021, para. 4). Consequently, states which are currently testing their ASAT technology could accuse the US of being hypocritical in this context (Foye and Hernández 2022, para. 6). Moreover, the US' strategic advantage in ASAT technology could be considered partly responsible for provoking an arms race in this field (Foye and Hernández 2022, para. 6).Although the resolution passed, it is this strategic imbalance in ASAT technology which will undermine attempts to pass a legally binding treaty on ASAT weapons control.

Legality of ASAT Weapons

As discussed, the UN Resolution to stop the testing of ASAT weapons is not legally binding, and no international laws are preventing their use in this capacity. However, using ASATs against another state would be against international law: indeed, attacking a state's satellite would be equivalent to attacking the state itself because states retain jurisdiction over any of their objects launched into space (Outer Space Treaty 1967 Article VIII). This would be viewed as an act of aggression and, therefore, a violation of Article 39 of the 1945 UN Charter, which is a well-established source of international law. Applying international law in this context would be largely reactionary to the initial attack, by which time multiple states may have used their ASAT weapons. In this scenario, the Kessler effect would likely be too late to prevent. Therefore, the international community and international legal bodies should take a proactive approach to making ASAT weapons illegal. This chapter will analyse the existing international law which applies to outer space and explore how it could be applied to ASAT technology.

Five UN treaties were created during the Cold War establishing the foundation of international space law (O'Grady 2016, p.2). There are other sources of international space law supported by subsequent treaties and domestic laws, but this chapter will focus on the UN "space treaties". Unlike the other treaties, the 1972 Liability Convention outlines a dispute resolution mechanism through a "Claims Commission" (O'Grady 2016, p.3). The process has some flaws, such as its lengthy progression and lack of impartiality requirements for adjudicators (O'Grady 2016, p.3). Furthermore, and most significantly, the process is not binding unless the parties to the dispute agree otherwise (O'Grady 2016, p.4). However, it sets a basis within the treaties for jurisdiction to be applied over international space law. In 1996, the Office for Outer Space Affairs (UNOOSA) and the Committee on the Peaceful Uses of Outer Space (COPUOS) proposed to establish a special chamber of the International Court of Justice (ICJ) to hear disputes related to outer space activities (O'Grady 2016, p.4). As space use increases, so does the legal framework surrounding it: in the coming years and decades, bodies such as the ICJ and the International Criminal Court (ICC) will have more power to make rulings on space law, drawing on treaties and international customs.

The five UN space treaties could provide enough of a legal basis for these international legal bodies to ban the use of ASAT weapons without creating a separate ASAT-focused treaty. For example, Article III of the 1967 Outer Space Treaty states that activities in outer space must be "in the interest of maintaining international peace and security" (Outer Space Treaty, 1967).
Launching an ASAT weapon into space to target a satellite would count as conducting an "activity". In space, which contradicts the "maintenance of international peace" claim. All states that have or are developing ASAT weapons signed this treaty: therefore, an international legal body may conclude that ASAT weapons contradict their obligations under Article III (Outer Space Treaty, 1967), effectively making their use illegal internationally.

Article IV of the Outer Space Treaty forbids states from placing nuclear weapons and weapons of mass destruction into orbit. This would be an imaginative interpretation of this treaty, but an international legal body could label ASAT weapons as weapons of mass destruction and, as such, illegal to use in space. Considering the enormous risks that ASAT weapons pose in causing the Kessler Effect, it is undisputable that they could cause "mass destruction." This is specifically relevant to brute force ASATs which have the potential to produce massive amounts of space debris. However, it may also be applicable to ASATs which do not use brute force. Satellites are constantly making corrections to avoid collisions with other satellites. Non-brute force ASATs that shut down satellites' function could be considered similarly dangerous as they may prevent a satellite from being able to avoid collisions. As anticipated, arguing that this type of ASAT would be illegal as a weapon of mass destruction is a very liberal interpretation of Article IV. However, when looking at Article III and Article IV combined, it shows that the document always intended for space to be left independent of military activities. An international legal body may therefore decide that ASAT weaponry contradicts the principles of the 1967 Outer Space Treaty.

The principle of jurisdiction could also be used to reinterpret the treaty law in space to make ASATs illegal. In fact, according to Article VIII of the 1967 Outer Space Treaty, states retain jurisdiction over an object launched into outer space. Applying this logic to ASAT tests, states such as the US (Dickinson 2021, para. 1) and Russia (Panda 2021, para. 2) have been destroying objects under their jurisdiction as they would be entitled to in a military exercise conducted on land. States continue to hold jurisdiction over objects and their "component parts" throughout their presence in space (Outer Space Treaty 1967 Article VIII). The component parts may, in this case, apply to space debris caused by ASAT weapons tests. The fact that states maintain jurisdiction over all the pieces of space debris that they produced could make them legally responsible for any potential damages caused to other states. Article VII of the Outer Space Treaty highlights that each state party is internationally liable for damages caused to another state party of the treaty. The 1972 Liability Convention reaffirms this principle in more detail in Articles II and VIII: the focus of these articles seems to set a precedent for how states can receive compensation in the event of accidental damage in space.

Therefore, it will be interesting to see how dispute mechanisms evolve in determining liability for damaged objects in orbit (O'Grady 2016, p.3): in the future, these dispute mechanisms and international legal bodies may take a more holistic interpretation of the term "damage" from these treaties. The cost of littering LEO with space debris from satellites will cause many states to "suffer damage" (Liability Convention 1972 Article VIII) such as the potential risks to their astronauts or objects in orbit, the added costs associated with this risk, and future costs to humanity of a world where LEO is too dangerous to use. Dispute mechanisms and international legal organs may be willing to hear the cases where these "damages" have been suffered even from states which do not have active space operations (Liability Convention 1972 Article VIII (1) and Article VIII (3)).

An international legal custom may be established through successive cases where states practicing ASAT tests are found liable for causing damages to the international community. International customs are a source of international law which all states must abide by, even if they have not signed or ratified an international treaty. To establish a custom, there must be relevant state practice demonstrating that states are not acting in a specific way, in this case using brute force ASAT weapons.

Secondly, there must be an opinio juris which proves that states have not been using these weapons specifically because they believed they were bound by international obligations not to do so. For example, their obligations under the UN Charter or the Liability Convention may have led states to believe they could not use brute force ASAT weapons against one another or for testing purposes.
If dispute mechanisms and international legal bodies consistently decide that states are liable for testing brute force ASAT weapons, this could establish an international custom against their testing or use in general.

Future Treaties in Space Law

As previously explored, the resolution which called for states to stop testing ASAT weapons was not successful in uniting the international community against their use. The resolution was not legally binding, and many notable states with ASAT programmes voted against it: thus, a treaty seeking to ban the testing and use of ASATs would likely face similar challenges. It is just as likely that states that are currently developing their ASAT technology would not sign the treaty, meaning any obligations found in the document would not apply to them. However, considering the problem that congestion is causing to all relevant states using LEO, gathering widespread support for an Anti-Congestion Treaty seems more likely. In fact, China has complained to the UN Space Agency that, on two occasions, the Chinese space station has had to take evasive action to avoid hitting Starlink's satellites (Zurich 2022, para. 6). This topic has far more international support: perhaps in drafting a treaty to prevent space congestion, the grey areas concerning space debris and dispute settlements will be addressed. This does not directly affect the use of ASAT weapons; still, defining these laws may give international legal bodies the tools to make rulings against the legality of these weapons in the future.

Concluding remarks

There has never been more international interest in finding a solution to a congested and cluttered space. As a framework to address congestion is developed, the risks of ASAT weapons will inevitably face similar coverage. Unfortunately, it is unlikely that states will agree to sign a treaty banning the testing and use of ASAT weapons. However, this paper has explored some alternative methods for ASAT technology to become illegal under international law. The future developments in dispute mechanisms regarding space and the actions of international legal bodies such as the ICJ will be essential in this process. By reinterpreting existing space treaties, these bodies could decide that the current use of ASATs violates states' obligations under international law. Finally, as time progresses, international legal customs halting the use of ASAT weapons may develop.

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