ANTI-SATELLITE WEAPONS & THE LAW OF ARMED CONFLICT

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Introduction

In the past few decades, the world has witnessed some of the biggest changes to the space establishment since the Cold War.[1] The realm of outer space has always been defined by significant technological innovations. Unfortunately, it has also been tainted by complex terrestrial geopolitics. Since the Soviet Union launched Sputnik One in 1957, we have seen more countries join the ranks of "space faring nations," a diversification in space technologies, the establishment of defensive space commands, and an increased potential for conflict in a new domain. In addition to these, public actors are no longer the sole stakeholders in space as new private companies, led by billionaires who are as ambitious as they are eccentric, have entered the fray marking the dawn of the commercialization of space.[2] While all these issues and players grab the attention of the public, a key foundational issue has been left without support since the 1960s: Space governance.[3]

The dangers of this lack of progress in international space regimes can be exemplified by the issues with anti-satellite weapons (ASAT). These weapons threaten to jeopardize the peaceful exploration and exploitation of space.[4] Due to the security risks of these weapons, many experts across the globe are no longer asking *if* there will be a military conflict in space, but rather *when* will there be a conflict.[5] This less than

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[1] Sophie Goguichvili ET AL., *The Global Legal Landscape of Space: Who Writes the Rules on the Final Frontier?*, WILSON CTR. (Oct. 1, 2021), *available at* https://www.wilsoncenter.org/article/global-legal-landscape-space-who-writes-rules-final-frontier (last visited Feb. 15, 2023).

[2] *See id.*

[3] *See id.*

[4] David A. Koplow, *ASAT-isfaction: Customary International Law and the Regulation of Anti-Satellite Weapons*, 30 MICH. J. INT'L L. 1187, 1188 (2009).

[5] *See* Stuart Clark, *'It's going to happen': is the world ready for war in space?*, THE GUARDIAN (Apr. 15, 2018), *available at* https://www.theguardian.com/science/2018/apr/15/its-going-to-happen-is-world-ready-for-war-in-space (last visited Feb. 1, 2023) (quoting Michael Schmitt, professor of public international law and a space war expert at University of Exeter

optimistic view can also be seen throughout the military and defense policies of the various major players in space. U.S. space doctrine calls for both defensive and offensive space capabilities considering space as a military domain.[6] While Department of Defense guidelines call for limiting U.S. space capabilities to self-defense options, emphasizing protection, deterrence, and international partnerships, the U.S. interprets the "peaceful purposes" provision in the Outer Space Treaty (OST) to mean non-aggressive uses of space—not non-military uses.[7] Other countries, such as Russia and China, have adopted similar views recognizing space as a domain for potential conflict and an environment for the assertion of self-defense.[8]

Since all three major players recognize space as a military domain of operations, and act accordingly to this, it is important to identify the applicable international law regimes and principles that would apply to a possible conflict. This paper seeks to identify how the Law of Armed Conflict would apply to the use of ASATs in a military conflict.

I. The Threat of ASATs

A. WHAT ARE ASATS

ASATs "are any intentional physical object or electromagnetic force directed against the normal functioning of a space-based asset."[9] ASATs are categorized as either kinetic physical weapons or non-kinetic physical weapons.[10] The most traditional form of kinetic ASAT weapons are direct-ascent ballistic missiles.[11] These weapons are launched on an intercept trajectory, and collide with the satellite causing different

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in the U.K., "[i]t is absolutely inevitable that we will see conflict move into space.").

[6] Matthew T. King & Laurie R. Blank, *International Law and Security in Outer Space: Now and Tomorrow*, 113 AM. J. INT'L L. UNBOUND 125, 126 (2019).

[7] *Id.*

[8] *See id.*

[9] Cort Thompson, *Avoiding Pyrrhic Victories in Orbit: A Need for Kinetic Anti-Satellite Arms Control in the Twenty-First Century*, 85 J. OF AIR L. & COM. 105, 111 (2020).

[10] *See* Todd Harrison et al., *Space Threat Assessment 2021*, CTR. FOR STRATEGIC & INT'L STUD. 1, 3-4 (Apr. 2021), *available at* https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/210331_Harrison_SpaceThreatAssessment2021.pdf?VersionId=gVYhCn79enGCOZtcQnA6MLkeKlcwqqks (last visited Feb. 19, 2023).

[11] Thompson, *supra* note 9, at 111.

magnitudes of damage depending on the relative speed at the time of impact.[12] Other kinetic ASATs include co-orbital weapons which establish an orbit of their own that eventually will intercept the target's orbit.[13] They then either collide with or detonate next to the target, destroying it.[14]

Non-kinetic ASATs utilize a variety of different means to neutralize their targets. These types of ASATs can either manipulate the electromagnetic spectrum to interfere with the link between the satellite and the ground control station or be directed against the satellite itself.[15] Examples of the means and results of such an attack include exploiting "high-energy lasers, microwaves, cyber-attacks, or beams of sub-atomic particles to burn a hole in the satellite, permanently or temporarily blind its sensors, jam or spoof its communications, or scramble its internal electronics."[16] Additionally, cyber-attacks could be used to turn off a satellite, or "even commandeer it for the attacker's own use."[17]

B. BRIEF HISTORY OF ASATS

The threat of ASATs dates back to the Cold War and the start of the space race between the U.S. and the Soviet Union.[18] In fact, the U.S. first began researching ASATs only weeks after the Soviets launched Sputnik into orbit in 1957.[19] There are currently only four nations that have successfully conducted an ASAT test by striking their own orbiting satellite.[20] The U.S. and the Soviet Union have the longest histories of testing various ASAT capabilities throughout the Cold War.[21] China obtained ASATs much later and conducted its first successful strike in 2007.[22] In 2019, India became the latest nation to demonstrate effective

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[12] *See id.* at 111–12.
[13] *See id.*
[14] *See id.*
[15] *See id.*
[16] David Koplow, *An Inference About Interference: A Surprising Application of Existing International Law to Inhibit Anti-Satellite Weapons*, 35 U. PA. J. INT'L L. 737, 795 (2014).
[17] Koplow, *supra* note 4, at 1201.
[18] Koplow, *supra* note 16, at 794.
[19] *See id.*
[20] Thompson, *supra* note 9, at 108.
[21] Koplow, *supra* note 16, at 797, 801.
[22] *See id.* at 802.

ASAT capabilities when it launched a direct-ascent ASAT targeting an Indian defense satellite.[23]

Although all four of these countries have ASAT capabilities, there has only been one publicly acknowledged non-kinetic ASAT test using directed energy.[24] In 1997, the U.S. conducted its MIRACL (Mid-InfraRed Advanced Chemical Laser) experiment by pointing a two-megawatt laser at a defunct MSTI-3 satellite in attempt to either blind or destroy it.[25] The MIRACL laser failed to produce the intended results, but an accompanying lower-powered laser was able to temporarily blind the satellite.[26] This was an equally intriguing as terrifying result due to the fact that this commercially available laser displayed impressive military power.[27] Although this is the only publicly acknowledged non-kinetic ASAT test, it is speculated that in 2006 the Chinese attempted to "laser paint" an overhead U.S. satellite, and there are reports that the Russians are developing similar laser-based systems.[28] Additionally, the relevant technology for these weapons is within the reach of even modest military powers such as Libya, Cuba, and Iran.[29]

While these are the only known countries with some form of ASAT capabilities, this list could grow very quickly in the coming years. Due to technological overlaps, any country that pursues civilian space launch vehicles, military-long range ballistic missiles, or anti-missiles has the potential to develop an ASAT capacity.[30] This presents an especially difficult situation when dealing with anti-ballistic missiles (ABM). The equipment, knowledge, and flight test of ASATs and ABMs are remarkably similar and can be easily adapted to the other purpose.[31] An example of this crossover occurred in 2008 when the U.S. Navy shot down a failing U.S. satellite with a standard ship-borne ballistic missile.[32] The U.S. declined to characterize this event as an ASAT test, but many skeptics saw this as an undoubtable flex of U.S. ASAT muscles.[33] The similarities between ASATs and ABMs pose another issue when it comes to ASAT regulations as it can be difficult to discern whether a country is

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[23] Thompson, *supra* note 8, at 107.
[24] Koplow, *supra* note 4, at 1212.
[25] *See id.*
[26] *See id.*
[27] *See id.*
[28] Thompson, *supra* note 9, at 161.
[29] Koplow, *supra* note 4, at 1213.
[30] *See id.* at 1211.
[31] Koplow, *supra* note 16, at 798.
[32] Koplow, *supra* note 16, at 798-99.
[33] Koplow, *supra* note 4, at 1210.

engaging in ASAT or AMB activities.[34] However, Cold War bilateral-agreements that controlled ABMs and, in turn, ASATs are no longer a concern to the U.S. as in 2001 the Bush administration withdrew from the Treaty on Limitation of Anti-Ballistic Missile Systems in an effort to consolidate the U.S. policy of "space control."[35]

C. WHY DO ASATS MATTER?

ASATs and the regulation thereof is important and dangerous for two main reasons. The first reason is that space debris is created as the result of an ASAT kinetic strike.[36] Unlike a non-kinetic directed energy attack, when the interceptor rams into or detonates next to a satellite, it fragments into thousands of pieces.[37] The time it takes for the debris to degrade back into the Earth's atmosphere depends on the altitude of the orbiting target.[38] Objects in Low-Earth orbit will degrade quickly while objects in Mid-Earth orbit or Geostationary orbit can remain in space for centuries or indefinitely.[39] The debris that results from these strikes is worsening an already hazardous environment that is polluted with vast amounts of leftover "junk" from earlier launches.[40] As of January 1, 2023, NASA estimates that the amount of material orbiting the Earth exceeds 9,000 metric tons.[41]

The most significant debris-producing event occurred in 2007, when China launched a direct-ascent ASAT missile at one of their weather satellites.[42] The strike produced an estimated 35,000 pieces of debris, and accounts for 17% of all human-caused debris in orbit.[43] This is widely considered to be the worst debris-causing event predominantly because the altitude of the collision means that the resulting debris will remain in orbit for centuries, thus making future space operations more hazardous for all countries.[44] On November 15, 2021, these same worries

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[34] Koplow, *supra* note 16, at 798.
[35] Jackson Maogoto & Steven Freeland, *The Final Frontier: The Laws of Armed Conflict and Space Warfare*, 23 CONN. J. INT'L L. 165, 165 (2007).
[36] Koplow, *supra* note 4, at 1201.
[37] Koplow, *supra* note 4, 1201.
[38] Thompson, *supra* note 9, at 108–09.
[39] *See id.* at 110.
[40] Koplow, *supra* note 16, at 747.
[41] *Orbital Debris Program Office*, NASA, *available at* https://orbitaldebris.jsc.nasa.gov/faq/# (last visited Jan. 27, 2023).
[42] Thompson, *supra* note 9, at 119.
[43] *See id.* at 119–20; Koplow, *supra* note 16, at 802.
[44] Koplow, *supra* note 16, at 802–03.

were brought back to the forefront as Russia conducted a similar ASAT test against one of their own satellites.[45] The strike was said to have generated 1,500 pieces of trackable debris, and caused the crew aboard the International Space Station to make preparations to evacuate.[46]

Another factor that exacerbates the issue is the difficulty of tracking all this debris. Currently, only the U.S., with the Space Surveillance Network (SSN), and Russia can monitor objects that are approximately ten centimeters or larger in diameter.[47] The SSN currently tracks 22,000 of these items, but there is an estimated 1.5 million pieces of untraceable debris that are one centimeter or smaller.[48] These tiny pieces of debris should not be underestimated as they can have devastating results. An elucidating example of this is that the windows of the space shuttle, which are built to survive the enormous pressures of re-entry into the Earth's atmosphere, have been damaged by tiny flecks of dried paint causing them to be repeatedly replaced after missions.[49] This, and other large-scale incidents, has caused an increasing concern among experts for the future safe and successful use of space.[50]

ASATs and space debris illustrate a tragedy of the commons. Outer space is seen as a global commons beyond the sovereignty of all nations. However, due to gaps in the governing international regimes, States continue to act in their own self-interest without any regard for the consequences of their actions.[51] Without even accounting for the debris caused by ASAT testing, space is becoming "increasingly congested, competitive, and contested."[52] A "land grab" type of mentality has developed in space as countries race to launch as many satellites as they can.[53] These satellites then jockey for the most favorable orbits, which are limited in number.[54] This competition over a finite number of spots,

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[45] Kylie Atwood Et Al., *US Says it Won't Tolerate Russia's Reckless and Dangerous Anti-Satellite Missile Test*, CNN (Nov. 16, 2021), *available at* https://www.cnn.com/2021/11/15/politics/russia-anti-satellite-weapon-test-scn/index.html (last visited Feb. 20, 2023).

[46] *See id.*

[47] Koplow, *supra* note 16, at 749; Thompson, *supra* note 9, at 118.

[48] *See* Thompson, *supra* note 9 at 118.

[49] *See* Thompson, *supra* note 9 at 751; Koplow, *supra* note 4, at 1203.

[50] Koplow, *supra* note 4, at 1202, 1204 (describing 2009 event where a U.S. Iridium-33 commercial satellite was "blindsided" by a non-operational, but intact, Russian Cosmos 2251).

[51] Thompson, *supra* note 9, at 114.

[52] Koplow, *supra* note 16, at 746 (quoting the U.S. Department of Defense).

[53] Thompson, *supra* note 9, at 115 (citing that the annual launch rate of spacecraft more than doubled from 129 launches to 262 from 2010 to 2015).

[54] *See id.* (describing geostationary orbits as the most valuable).

with an increasing amount of actors who desire them, "presents a situation that is ripe for future conflict."[55] This leads to the second reason why ASATs are so dangerous, especially for the U.S.

ASATs and their resulting debris present particular dangers to the military and strategic interests of the U.S. The U.S. is a pioneer for the use of space-communications for both civilian and military functions.[56] In fact, the U.S. military "outspends the rest of the world combined on military space applications and commands half the world's dedicated military space assets."[57] However, because the U.S. is the most dependent nation on its space systems, a vulnerability or "Achilles heel" is created that is very attractive for American adversaries.[58] This is truly an asymmetric dependence and a denial of space capabilities would be more devastating to the U.S. than to any other country.[59] The U.S. itself has self-identified this weakness when in 2006 Donald Rumsfeld stated that, "the U.S. is an attractive candidate for a Space Pearl Harbor."[60] From a logistics standpoint, satellites make excellent targets.[61] Satellites usually lack armor or defensive capabilities, they follow predictable orbital paths making them easy to attack, and they are very expensive to build so replacements would not be readily available.[62] Therefore, ASATs represent a way for countries like China and Russia, who have overall weaker militaries, to even the playing field against a conventionally stronger opponent like the U.S.[63]

Despite all the serious concerns that ASATs raise, no country has ever used any type of ASAT against another country in hostilities; their use has been limited to only tests against the country's own assets.[64] However, as briefly explored above, the risk of these weapons being used in hostilities and their consequences appear to be an increasingly real possibility. Realizing this, various academics and other

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[55] *See id.* at 115, 117 (stating that in the past decade the number of states operating satellites has increased to 50 and that over 100 states use space systems and services).

[56] Talia Blatt, *Anti-Satellite Weapons and the Emerging Space Arms Race*, HARV. INT'L REV., 31 (2020).

[57] Koplow, *supra* note 16, at 741.

[58] *See id.* at 746 n.13, 804 n.201 (quoting Chinese news agency as saying, "[f]or countries that could never win a war by using the method of tanks and planes, attacking the U.S. space system may be an irresistible and most tempting choice).

[59] Blatt, *supra* note 56, at 31.

[60] Koplow, *supra* note 4, at 1219 n.102.

[61] *See id.* at 1200.

[62] *See id.*

[63] Blatt, *supra* note 56, at 31.

[64] Koplow, *supra* note 4, at 1215.

nongovernmental entities have united to assess and develop the legal landscape for the military uses of outer space. The two projects leading the charge in this area are the Woomera Manual on the International Law of Military Space Operations, and the Manual on International Law Applicable to Military Uses of Outer Space.[65] Although these manuals will not be binding law, they will be able to assist practitioners by laying out the applicable concepts relating to the Law of Armed Conflict (also known as International Humanitarian Law or Jus in Bello).[66] As of now, these manuals have not been publicized, but it is important to begin theorizing how the LOAC would be applied to the use of an ASAT.

II. Applying the Law of Armed Conflict

A. DOES THE LAW OF ARMED CONFLICT APPLY?

When analyzing what laws apply in space, it is first important to start with the Outer Space Treaty of 1967. The treaty, also known as the "constitution of space," was established to create binding obligations and restrictions on countries in their use and exploration of outer space.[67] The two most relevant provisions to the discussion of applying the LOAC to ASATs are Article III and Article IV. Article III states that parties must carry out their activities in space "in accordance with international law, including the Charter of the United Nations."[68] Article IV of the treaty places a restriction on countries as they are prohibited from installing nuclear weapons or any other weapons of mass destruction on the moon, any celestial body, or stationing them in orbit in any other manner.[69] It is also important to note here that scholars generally accept that space law is a form of *lex specialis* in cases of specific regulations, with general international law filling in the gaps to unregulated areas.[70]

Applying the Outer Space Treaty, two background principles to this discussion become clear. Space is not to be viewed as some lawless domain in a vacuum (literally and metaphorically) devoid of rules. This provision has the clear effect of applying customary and treaty principles

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[65] King, *supra* note 6, at 129.
[66] *See id.*
[67] Thompson, *supra* note 9, at 122.
[68] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies art. III, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 (hereinafter Outer Space Treaty).
[69] *See id.* at art. IV.
[70] Thompson, *supra* note 9, at 122.

of international law that can be sensibly interpreted as extending to outer space.[71] Second, Article IV would not prohibit the placement of conventional weapons in orbit if they do not meet the definition of weapons of mass destruction (WMDs).[72] Currently, the United Nations Office for Disarmament Affairs (UNODA) recognizes three classes of WMDs: Nuclear, chemical, and biological.[73] As long as the ASATs do not utilize any WMDs to achieve their goals, nothing in Article IV prevents their use under the Outer Space Treaty.

The LOAC is comprised of an extensive set of conventional and customary rules, with the 1907 Hague Convention and the 1949 Geneva Convention lying at its foundation.[74] Article 22 of the 1907 Convention states that, "the right of belligerents to adopt means of injuring the enemy is not unlimited."[75] The convention also expressed another cardinal principle of the LOAC which is a prohibition on the employment of "arms, projectiles, or materials calculated to cause unnecessary suffering."[76] Both of these principles were later codified in Geneva Convention Additional Protocol I (AP I) which also requires "states to investigate the legality of new weapons, means, and methods in the course of their adoption."[77]

While this is a basic synopsis of a robust body of international law, some might point to the fact that many of the relevant clauses of these documents are grounded in vocabulary of a terrestrial nature.[78] For example, some might infer from the tile of the Hague Regulations that they are unable to apply in situations outside "war on land."[79] To counter this assertion, many scholars point to what is known as the "Martens Clause." The modern version of the clause is found in Article 1(2) of AP I, and states, "[i]n cases not covered by this protocol or by other international agreements, civilians and combatants remain under the protection and authority of the principles of international law derived from established custom, from the principles of humanity and the dictates

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[71] *See* Bill Boothby, *Space Weapons and the Law*, 93 INT'L L. STUD. 179, 201 (2017).

[72] Thompson, *supra* note 9, at 123.

[73] *See id.* at 124 n.82.

[74] Jack Mawdsley, *Applying Core Principles of Int'l Humanitarian L. to Military Operations in Space*, 25 J. OF CONFLICT & SEC. L. 263, 266 (2020)

[75] Thompson, *supra* note 9, at 141.

[76] Boothby, *supra* note 71, at 185.

[77] *See id.*; Thompson, *supra* note 16, at 141.

[78] *See* Mawdsley, *supra* note 74, at 266.

[79] *See id.*

of public conscience."[80] Due to the clause's dynamic phrasing, many have argued that this clearly shows an anticipation for the need to regulate unforeseen types of warfare.[81] This can be illustrated by the International Court of Justice's famous *Nuclear Weapons* Advisory opinion where the court had to clarify the scope of the relevant law in relation to a novel weapon.[82] The court held that although the United Nations Charter made no specific reference to nuclear weapons in its prohibition on the threat or use of force, the "intrinsically humanitarian character" of the document requires the LOAC to "apply to any use of force, regardless of the weapons employed."[83] The combination of treaty, customary international law, and case precedent make it clear that the LOAC would apply to the use of ASATs in space.

At the core of the LOAC are two competing interests: "That every act of war must be justified as necessary to the attainment of a discernible military advantage, and that humanity puts a break on actions that might otherwise be justified as militarily necessary."[84] Under the LOAC, there are four sub-principles that assist in applying the doctrine to a situation. These principles are military necessity, distinction, proportionality, and precaution in attack.[85]

B. MILITARY NECESSITY

Military necessity requires the reasonable connection between destruction and the overcoming of an enemy force.[86] The concept first appeared in Articles 15 and 16 of the Lieber Code which "allowed for all destruction of property, and obstruction of the ways and channels of traffic, travel, or communication" but prohibited against "wanton devastation of a district."[87] The belligerent must specify the imperative military advantage intended to be gained by an attack.[88] The principle of necessity pertains to those measures "not forbidden by the law of war and required to secure the overpowering of the enemy."[89] The underlying theme of this principle is that attacks must be directed at legitimate

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[80] *See id.* at 267.
[81] *See id.*
[82] *See id.* at 268.
[83] *Id.*
[84] *See id.* at 270–71.
[85] *See id.* at 271; Maogoto, *supra* note 35, at 176.
[86] Maogoto, *supra* note 35, at 177.
[87] Thompson, *supra* note 9, at 142.
[88] *See* Maogoto, *supra* note 35, at 177.
[89] *Id.*

military targets whose destruction will concretely contribute to victory in armed conflict.[90]

When applying military necessity to ASATs, if the commander can identify how the destruction of the satellite would further the war effort then it is likely that the attack would proceed.[91] Necessity may, however, require that certain means and weapons be used to complete the objective.[92] If a country had both kinetic and non-kinetic ASAT capabilities, then a necessity analysis would compel the use of the non-kinetic ASAT.[93] As long as the non-kinetic ASAT was available and as equally effective in achieving the desired results, the use of a debris-producing kinetic ASAT would then no longer be necessary.[94]

C. DISTINCTION

Distinction is the principle that military commanders must distinguish between civilian objects and military objectives when targeting an adversary's infrastructure.[95] Military objectives are objects whose "destruction, capture, or neutralization offers a definite military advantage at the time of the action."[96] Under Article 48 of AP I, parties to a conflict shall "at all times distinguish between the civilian population and combatants and between civilian objects and military objects and shall direct their operations only against military objectives."[97] In order to determine whether an object is a legitimate military objective, Article 52(2) of AP I requires a commander to be satisfied that an object's "nature, location, purpose, or use" definitively makes an effective contribution to the enemy's military action.[98] Although the U.S. objects to AP I on other grounds, this definition is viewed as customary international law and aligns with the general practices of the U.S.[99]

Additionally, the existence of dual use objects further complicates this analysis. This problem has only grown in the modern era as the line between protected objects and lawful targets have blurred due to an increasing dependency on civilians and their activities during military

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[90] *See id.*; Thompson, *supra* note 9, at 142.
[91] *See* Thompson, *supra* note 9, at 145.
[92] *Id.*
[93] *Id.*
[94] Koplow, *supra* note 4, at 1248.
[95] Thompson, *supra* note 9, at 142.
[96] *Id.* at 142–43.
[97] Mawdsley, *supra* note 74, at 271.
[98] *See id.* at 272.
[99] Mawdsley, *supra* note 74, at 272.

operations.[100] The NATO bombing of Radio Television Serbia is a guiding illustration of dealing with an object that provides both civilian and military services.[101] The International Criminal Tribunal for the Former Yugoslavia determined that the station was a legitimate military target because it transmitted military communications.[102] The court made this determination despite the deaths of sixteen civilians inside.[103] This demonstrates that as long as the qualifiers of Article 52(2) are met, an object's contribution to civilian life may be disregarded.[104] Thus, the object's use for civilian purposes will ultimately not affect its classification as a military objective.[105]

Applying distinction to ASATs presents many complications that exist in a grey zone. Satellites are becoming increasingly dual use having both civilian and military purposes.[106] For example, the U.S. released an official policy in 2003 calling for the employment, to the largest extent as possible, of private sector satellite services for governmental, military, and intelligence purposes.[107] Regardless of this, U.S. military officials still believe that "satellites are too militarily useful to pretend that adversaries will consider them off limits."[108] Moreover, the U.S. has a broader interpretation of "military action" in a distinction analysis.[109] Under the U.S. interpretation, the destruction of an object does not need to offer immediate tactical or operation gains.[110] All that is needed is that the object was effectively contributing to the enemy's warfighting or war-sustaining capabilities.[111] Therefore the U.S. would believe that the principle of distinction would be satisfied if the enemy's satellite offered a definite military advantage at the time the decision to strike was made.[112] While other countries do not share the same interpretations as the U.S., the fact that the U.S. believes in such wide discretion could prompt other countries to adopt similar views. This could be a real possibility due to the nature of ASATs and the vital roles satellites play

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[100] *See* Maogoto, *supra* note 35, at 17.
[101] *See* Thompson, *supra* note 9, at 144.
[102] Thompson, *supra* note 9, at 144.
[103] Thompson, *supra* note 9, at 144.
[104] Mawdsley, *supra* note 74, at 274.
[105] *See* Mawdsley, *supra* note 74, at 274.
[106] *See id.*
[107] Koplow, *supra* note 16, at 742–43.
[108] Mawdsley, *supra* note 74, at 272.
[109] *See id.* at 273.
[110] *See id.*
[111] *See id.*
[112] *See id.*

in military infrastructure. Given this, and prior examples like Serbia, an argument that satisfies distinction could be made.

D. PROPORTIONALITY

The principle of proportionality requires a balancing of the positive, direct military value of a proposed attack against undesired harms to civilians.[113] Proportionality is found in AP I Article 51(5)(b) which states that "an act is disproportionate if the incidental loss of civilian life or damage to civilian objects is excessive in relation to the concrete and direct military advantage expected as a result of the attack."[114] Article 57(2) requires "commanders to minimize incidental loss or damage when evaluating the proportionality of an attack."[115] The essence of this principle is that military commanders must account for collateral damage that would result from a use of military force.[116] There is currently a debate over whether this concept of collateral damage should be limited to strictly "direct" damages, or if "indirect" damages should be considered as well.[117] Direct damages would be harm caused as the immediate result of an attack, such as the collapsing of a building hit by a bomb.[118] Indirect collateral damages, also referred to as reverberating damage, would be harms that occur after an attack but were a foreseeable result of it.[119] An example of this would be the loss of electricity to a hospital after bombing a powerplant.[120]

Generally, proportionality is the most subjective of the sub-principles. It is often very difficult to apply proportionality in practice because "different people ascribe different values to military advantage vis-à-vis civilian injury and damage."[121] This subjectivity means that different people can reach different but reasonable outcomes when conducting a proportionality analysis. Part of this subjectivity is deciding whether to factor indirect collateral damages into the analysis. Those who do not account for reverberating damages can be said to ascribe to a limited view of proportionality.[122] In the context of space, there are no

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[113] Koplow, *supra* note 4, at 1246.
[114] Thompson, *supra* note 9, at 143.
[115] *Id.*
[116] Mawdsley, *supra* note 74, at 275.
[117] *See id.*
[118] *Id.*
[119] *Id.*
[120] *See id.*
[121] Maogoto, *supra* note 35, at 178.
[122] Mawdsley, *supra* note 74, at 275.

local civilian populations who would incidentally be at risk as the result of an ASAT attack.[123] Because the LOAC is concerned with minimizing human suffering, and there is no risk for incidental loss of life or injury to civilians in the immediate scope of the attack, then proportionality would be satisfied.[124] Critics of this view, who would rather apply an enhanced proportionality analysis, state that this fails to account for both the possible indirect harm to civilians on Earth or damage to other space assets in orbit from the resulting debris.[125]

To better illustrate the application of the differing proportionality views, one could theorize an attack on a GPS satellite.[126] An attack on a GPS satellite would undoubtedly provide military advantage to an adversary. However, the attack would also cause widespread harm to civilians.[127] The attack would cause traffic accidents due to the loss of lane control systems, affect the navigation systems of ships, and affect the general infrastructure of the country.[128] Under limited proportionality, if there is no direct harm or damage then the attack was proportional.[129] Enhanced proportionality would enlarge the scope of the traditional test and require "decision makers to consider if the loss of a dual-use object's civilian function would be excessive as compared to the military advantage gained from its attack."[130] Since the reverberating harm to civilians would be foreseeable and clear, the attack would be disallowed.[131] However, this view is unlikely to become mainstream for two reasons. First, opponents will claim that the indirect effects are far too speculative and remote to be considered.[132] Second, there is a common notion in the LOAC that any civilian loss could be outweighed by an even greater military advantage.[133] Due to these reasons, the traditional limited view of proportionality will likely continue to apply and allow commanders to green light an ASAT strike.

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[123] *See id.*
[124] *See id.*
[125] *See id.* at 276.
[126] *See id.*
[127] Mawdsley, *supra* note 74, at 276.
[128] *See id.*
[129] *See id.*
[130] *Id.*
[131] *See id.* at 277.
[132] Mawdsley, *supra* note 74, at 277.
[133] *See id.* at 278.

E. PRECAUTIONS IN ATTACK

Intertwined with the concepts of some of the prior principles, is the requirement of taking precautions in attacks. Article 57(2)(ii) of AP I mandates that when a belligerent undertakes an attack on land they shall "take all feasible precautions in the choice of means and methods of attack with a view to avoiding, and in any event minimizing, incidental loss of civilian life, injury to civilians and damage to civilian objects.[134] Article 57(4) of AP I modifies the test to a lower level of reasonable precautions for military operations at sea and in the air.[135] The Convention on Certain Conventional Weapons defines feasible precautions as those which are "practicable or practically possible taking into account all circumstances ruling at the time, including humanitarian and military considerations."[136] The main thrust of this requirement is that States must understand and account for the potential impacts of the various weapons they use.[137]

The principle of precaution mainly pertains to the type of ASAT that a state would select in conducting an attack. As aforementioned, one of the biggest threats that ASATs present are the debris that result from a kinetic strike. The argument is that if a state uses a kinetic ASAT while non-kinetic means were available, then the use of the kinetic ASAT would produce "wanton destruction" through the creation of debris.[138] Here, computer modeling could be used to predict the amount of debris that would be produced and the altitude of where that debris would end up.[139] However, restricting the type of weapon used in this situation could decrease the military advantage to be gained from it, therefore outweighing the incalculable probabilities of future harm from resulting debris.[140]

III. Conclusion

Based on current projections of debris in orbit, "an accidental collision is expected to occur every five to nine years."[141] These projections account only for the objects and debris in space now. If

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[134] *See id.*
[135] *See id.* at 278–79.
[136] *Id.* at 278.
[137] Mawdsley, *supra* note 74, at 279.
[138] Thompson, *supra* note 9, at 145.
[139] *Id.* at 146.
[140] Mawdsley, *supra* note 74, at 281.
[141] Thompson, *supra* note 9, at 117.

current trends continue with the number of objects being launched into space increasing every year, ASATs represent a possible match to light the powder keg. Our actions in space have the potential to reach a point where we cannot reverse the harm we cause. As the amount of material in space grows, the risk of something known as Kessler Syndrome, does as well.[142] The theory postulates that "a chain reaction of orbital breakups may occur from debris colliding with either space assets or other debris, potentially causing a cascading effect and significantly reducing the number of viable orbits."[143]

The U.S. has the most to lose in the theater of space as most of their civilian and military infrastructures rely on space-based assets. U.S. adversaries know this and are actively seeking capabilities to exploit this. Therefore, the U.S. would have the most to gain in finding ways to curtail the use of ASATs that create debris. As previously explored, the usual grey zones produced from the various balancing tests of the LOAC is further obscured when applied to space. The U.S. should begin to call for a more scrutinizing application of the LOAC in space. Specifically, military commanders should consider the reverberating effects a kinetic ASAT strike would produce. This would include both the indirect effects on the Earth to civilians and the debris that indiscriminately jeopardizes all space assets. While the general tenets of this view may be unpopular and unlikely, it is not fully unsupported by commanders in the military. As Vice Admiral Crawford stated, "the military planner's job would not '. . . become unduly burdensome merely because an additional level of cognition is required . . . .'"[144]

Another future factor to consider is the role of private actors in space. Space is no longer the domain of government entities, and private companies are doing more now than just launching satellites. The actions of the world's militaries in space do not just affect their use of space but the entire world's. Debris threatens private objects in current orbit, and future opportunities to launch or traverse freely in outer space. There is a large amount of money to be made in outer space and this could incentivize private actors to lobby against the use of ASATs.[145]

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[142] *Id.*

[143] *Id.* at 117–18.

[144] Mawdsley, *supra* note 74, at 277.

[145] *See* Jamie Carter, *A Bizarre Trillion-Dollar Asteroid Worth More Than Our Planet Is Now Aligned With The Earth And Sun*, Forbes (Dec. 5, 2020, 10:00PM), *available at* https://www.forbes.com/sites/jamiecartereurope/2020/12/05/a-bizarre-trillion-dollar-asteroid-worth-more-than-our-planet-is-now-aligned-with-the-earth-and-sun (last visited Feb. 17, 2023) (describing asteroid worth 10,000 quadrillion dollars).

The overall theme of the Outer Space Treaty is that humanity shares a common interest in space and all aspects of human activity should be carried out for peaceful purposes. The use of ASATs not only threatens these general tenors, but also the future exploration of the domain that holds the answers to some of humanity's most existential questions.