Death From Above: The Weaponization of Outer Space and the Threat to International Humanitarian Law

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Death from Above?

*The Weaponization of Space and the Threat to International Humanitarian Law*

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1. **Introduction**

Since the dawn of the satellite age with Russia’s *Sputnik 1* in 1957, and the launch of the first communications satellite *Telstar* five years later, humanity has gradually but undeniably become dependent on satellite communication systems to maintain global economic, military and informational links between nations.¹ Indeed, in an era where instantaneous international communication is the norm, satellites have become vital instruments for the maintenance of peace and stability.² Concurrent with these peaceful developments, ever-more powerful military satellites are today facilitating the prolific use of unmanned combat drones for tactical air strikes, and dramatically increasing the degree of global spy surveillance.³ It is not surprising then, that rapid advances in technology are leading countries to develop anti-satellite (“ASAT”) missile weapons systems, ground-based ASAT disruptive lasers (non-kinetic kill systems),⁴ and low-earth-orbit space-based conventional drone bombers. The widespread use of drone weapons today, and the potential use of ASAT weapons in future wars, has necessitated scrutiny of how international humanitarian law (IHL) applies to the ongoing weaponization of space and the high-tech nature of combat in the twenty-first century.

2. **Thesis**

This paper will argue that the use of ASAT missile weapons and potential use of space-based drone bombers in combat will severely impede the ability of countries to comply with international humanitarian law, will increase civilian losses in conflicts, and argue that these weapons systems are more akin in nature to weapons of mass destruction (WMD) and...
therefore should be treated as such. First, it will be argued that the proportionality and distinction considerations set out under Additional Protocol I of the Geneva Convention (AP1)\(^5\) are difficult to determine when using ASAT weaponry. Second, that ASAT weaponry, when used in conjunction with coordinated cyber attacks, has the potential to rapidly cripple vital civilian infrastructure, and thus harm civilian populations, making the military necessity of ASAT attacks questionable under IHL. Finally, it will be argued that while the development of ASAT weapons is a natural by-product of a world dependent on the satellite-based communication systems, the use of ASAT weapons would have a destabilizing effect in warfare by encouraging States to violate the *Outer Space Treaty* in the pursuit of developing space-based WMD systems. As such, this paper will present the case for the international community to establish a treaty prohibiting the use of ASATs and space weapons, one similar in nature to the *Chemical Weapons Convention*, in order to outlaw the use of offensive and defence ASAT weapons systems and space-based conventional drone bombers.

### 3. Roadmap

First, in framing a discussion on ASAT weapons systems, the predominance of satellite usage around the world will be assessed to underscore their criticality to global stability. Next, existing ASAT and space weapon systems will be examined to provide understanding into the nature of their threat to IHL and the threat posed by space debris. This emphasis will then be contrasted with sources of international law relating to weapons in outer space, in particular the *Outer Space Treaty*, as well as sections of international humanitarian law from Additional Protocol I of the *Geneva Convention*. As a comparative analysis, the customary international law with respect to chemical weapons will then be assessed, to highlight how ASAT weapons

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could become universally conceptualized as an unacceptable form of warfare. This will serve to characterize ASAT and space weapons as ‘weapons of mass destruction’ under the scope of IHL, which will facilitate public discourse on the threat of space weapons to civilians.

4. **Background & Context**

The 1967 *Outer Space Treaty* (“OST”) prohibits the placement of weapons of mass destruction in the earth’s atmosphere, but critically, does not prohibit the use or placement of conventional weapons in space.⁶ Over the past five years, both China and the United States have tested ASAT missile weapons, respectively targeting and successfully destroying aging satellites located hundreds of kilometres above the earth.⁷ Both of these States -- along with Russia, India, Japan, France and the United Kingdom -- are alleged to have either developed the same ASAT missile deterrent capacity, or have the technological means to quickly produce this capacity, but have yet to test such a weapon.⁸ For it is ‘outer space’ - both with respect to human ambition and to the application of international humanitarian law - that is indeed the ‘final frontier’. Just how the international community approaches the serious legal issues that are emerging from this new field of IHL will determine the very future of warfare, humanity’s use of space, and the nature of global peace and stability.

a. **Proliferation of Satellites Globally and Exponential Vulnerability**

Satellites have become a vital piece of infrastructure for a wide spectrum of daily life, but particularly so in the context of military operations and war. Global positioning systems (GPS), international handheld telecommunications, and high-speed global data transfer -- all facilitated by exponentially more advanced spy and communications satellites-- have

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inalterably changed the nature of combat and intelligence dissemination.\textsuperscript{9} Concurrently, the satellite-linked globalized economy is more interconnected, interdependent and intricately intertwined than any other time in human history,\textsuperscript{10} and conversely, more vulnerable to attack than ever before. This is particularly true in the context of emerging weapons systems like ASATs which are specifically designed to target and destroy the very technology – satellites – that are literally connecting the world.

In the United States, satellites now function as essential links in “critical infrastructure,” and furthermore, play a vital role economically with “over 1100 corporations now exploiting space in one way or another.”\textsuperscript{11} Kazakhstan recently became the forty-seventh nation to undertake its own civilian space activities.\textsuperscript{12} Notwithstanding the recent global economic downtown, the proliferation of space and satellite technology is unlikely to abate any time soon, with global commercial space revenues now exceeding $140 billion per year.\textsuperscript{13} The value of direct U.S. investment in outer space is set to “soon reach half a trillion dollars, rivaling the size of U.S. capital investment in Europe.”\textsuperscript{14} The most recent statistics available indicate that 965 operational satellites now orbit the earth in an increasingly congested array,\textsuperscript{15} particularly in routes deemed “most favourable”\textsuperscript{16} for commercial operations. Given the exponential growth of smartphone use globally, satellites will continue to proliferate; so too will the criticality of satellites to daily life for more and more people all over the world.

\textsuperscript{9} Space Security, \textit{supra} note 4 at 25.
\textsuperscript{11} John E. Hyten, “A Sea of Peace or a Theater of War: Dealing with the Inevitable Conflict” \textit{Space} 7 (2000), <http://www.airpower.au.af.mil/airchronicles/apj02/fal02/hyten.html>
\textsuperscript{12} Space Security, “Trend 4.1: Growth in the number of actors accessing space” \textit{supra} note 4 at 77.
\textsuperscript{13} Space Security, \textit{supra} note 4 at 88.

In consideration of the centrality of satellites to modern life, some numerical statistics emphasize the emerging threat posed by anti-satellite weapons. According to the latest available assessments, the major world powers operate the following number of satellites:

- **United States:** Currently have 443 satellites in orbit, with 121 “known” military satellites, and 118 for other government purposes.
- **China:** total of 69 satellites in orbit.
- **Russia:** total of 101 satellites in orbit.
- **Rest of the world:** total of 355 satellites operated by remaining nations, nearly 100 less than the United States alone operates.17

While the specific functions of military satellites are often highly classified, the nature of satellites in orbit is such that their orbital path cannot be kept secret once they are launched. This ‘exposed’ reality means that nations’ satellites are equally unprotected in space, and thus vulnerable to attack by ASAT weapons. This is an important strategic reality that must be remembered throughout this assessment of how ASAT weapons systems impact the application of IHL. While some countries, such as the United States, possess a numerical advantage in terms of their total orbiting satellite population, this exposure means their infrastructure is arguably more open to ASAT or space-based weapons attack.

In light of this reality, in 2005 the *New York Times* reported that General Lance W. Lord, then commander of the United States’ Air Force Space Command (AFSPC), told an Air Force conference that “space superiority is not our birthright, but it is our destiny... Space superiority is our day-to-day mission. Space supremacy is our vision for the future.”18 This provocative statement acknowledges the simple fact that the United States controls the overwhelming majority of satellites in orbit around the earth. When combined with the world’s increased reliance on satellites, the statement by General Lord also raises questions about

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17 Satellite Database, supra note 15.
how other countries intend to protect such vital pieces of national infrastructure. On that note it is also worth explaining that in 1982 the United States created the Air Force Space Command as a distinct entity, one that is separate in control from the Air Force, in recognition of the unique operational requirements of outer space.\(^{19}\)

c. Composition of ASAT weapons systems

In a detailed examination of ASAT’s and their potential implications for customary international law, David Koplow explains in easy-to-understand detail the main types of ASAT weapons and how they work, stating:

“The first is “kinetic energy” interceptors, relying on a physical object that suddenly shoots up from earth and either collides with the target satellite, destroying it via high-speed impact, or approaches closely enough to blow up both itself and the target via a suicidal explosion.

The alternative ASAT technology relies instead on “directed energy,” such as a laser beam, a column of sub-atomic particles, radio-frequency transmissions, or a microwave generator. These gizmos could burn a fatal hole in the satellite’s skin, temporarily and reversibly (or permanently) blind its sensors, or possibly employ cyber warfare to alter the satellite’s on-board computers, switching it off or even commandeering it for the attacker’s own uses.”\(^ {20}\)

Along with these technologies, also under development are “co-orbital” ASAT systems, which are effectively mini-satellites that can be deployed by spacecraft and sent on missions to selectively destroy other satellites.\(^ {21}\) It is evident that countries are developing increasingly sophisticated means of denying an enemy’s satellite technology.

d. The X-37B Orbital Test Vehicle: Space-based Drone Bomber?


In addition to ASAT weapons systems, the United States is allegedly actively developing a so-called ‘space bomber’. Dubbed the X-37B Orbital Test Vehicle (OTV), the ‘space bomber’ is officially an unmanned vertical-takeoff, horizontal-landing (VTHL), reusable spaceplane.22 While still under development, and likely at least a decade from deployment, the X-37B first launched into space aboard an Atlas V rocket in April 2010, “after more than ten years of development by Boeing Corporation’s ‘Phantom Works’ black projects shop.”23 The spaceplane is a quarter of the size of the Space Shuttle and can stay aloft for nearly nine months, deploying solar panels for power. More importantly for IHL, the spaceplane has a payload bay that can deploy and retrieve small co-orbital ASAT mini-satellites, or, any number of weapons systems.24

The very clandestine development of the X-37B’s suggests its ultimate purpose is for missions beyond deploying co-orbital ASAT satellites and delivering materials to the International Space Station. Rather, as reported by the New York Times, analysts tracking the spaceplane noted its test flight trajectory passed over global trouble spots, including Iraq, Iran, Afghanistan, Pakistan and North Korea, and thus may be part of an experimental effort to develop sophisticated new surveillance systems.25 The fact that the spaceplane was able to be publicly tracked once more emphasizes the reality that space-based weapons will operate from a level ‘playing field’ in the future, should their development be allowed by the international community.

e. Recorded ASAT Tests

23 Ibid.
25 Space bomber, supra note 18.
While the threat posed by ASAT weapons cannot be overstated, the number of recorded tests of ASAT weapons is undeniably low.\textsuperscript{26} As such it is important not to create the false perception of a ‘global ASAT arms race’, or any sort of escalating scenario. As Koplow expresses, “Tests of satellite-killers in outer space have averaged approximately one per year since the space age began, but the vast bulk of that [ASAT test] activity occurred more than twenty-five years ago.”\textsuperscript{27} The end of the Cold War brought an abrupt halt to the need for the active development of ASAT systems. However, the rapid rise of China as a military and economic superpower over the last two decades is bringing renewed focus on ASAT technology, as militaries intend to maintain a qualitative edge in the control of information, intelligence and outer space itself.\textsuperscript{28} In terms of recent recorded tests, since 1985, depending on how one counts the ambiguous or incompletely documented cases, there have been:

- one kinetic (missile) interceptor test in space by the United States (2008);
- one high-energy laser ASAT test by the United States (1997);
- four interceptor tests by China (2005-2007);
- two or three directed energy ASAT events by China (2006);
- and no tests of either sort by the Soviet Union or Russia. (There may have been additional instances of non-destructive tests that have not been publicly identified.)\textsuperscript{29}

Critically, with respect to IHL, no state has ever used its ASAT system in hostilities or in a time of crisis against the spacecraft of another country.\textsuperscript{30}

\textbf{f. The Threat of Space Debris}

There is another significant reason so few ASAT tests have been conducted: ASAT tests create hazardous debris in space. Over 22,000 pieces of space junk and debris are

\begin{itemize}
  \item Space Security, supra note 4 at 157.
  \item Koplow, supra note 14 at 1206.
  \item Koplow, supra note 14 at 1206.
  \item Ibid. at 1206.
\end{itemize}
currently being tracked by the U.S. Department of Defense ‘Strategic Command.’ In response to this threat, the U.S. government has “promulgated regulations for minimizing the creation of new orbital debris” in its National Space Policy, at the same time as the commercial space industry has started speaking out against weapons tests that “unnecessarily litter space” with thousands of pieces of hazardous debris. The explosion of an ASAT missile creates a significant amount of space debris in the earth’s orbit.

An even more elemental assessment explains the central problem with conducting ASAT tests: space debris does not discriminate when it comes into contact with satellites. As Koplow explains, “Travelling at enormous orbital velocities (30,000 km/hr in low orbit), a chunk of random debris could obliterate an unlucky satellite.” American satellites are thus just as vulnerable to impact from debris caused by an American ASAT test, likewise for China and Russia. Emphasizing the threat of space debris, in November 2011 astronauts aboard the International Space Station were forced to take enter the Soyuz escape capsule as a protection measure, when debris from China’s 2007 ASAT test passed “within a half-mile” of the international orbiter. This close encounter also highlights the anthropogenic, polluted tragedy of space junk contaminating the earth’s orbit.

g. Rise of Ground-based ‘Directed Energy’ ASAT Non-Kinetic Kill Systems

While the lethality of space debris has discouraged ASAT missile tests, countries are not about to abandon ASAT weapons systems altogether; instead, many are actively

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31 "USSTRATCOM Space Control and Space Surveillance" United States Strategic Command <http://www.stratcom.mil/factsheets/USSTRATCOM_Space_Control_and_Space_Surveillance/>
developing ground-based laser ‘directed energy’ non-kinetic ASAT kill systems.\(^ {35}\) These laser systems are designed to “negate” satellites’ surveillance capabilities, but not destroy them, and thus the laser systems avoid the creation of space debris.\(^ {36}\) Air Force Undersecretary for Space Programs Gary Payton has explicitly rejected kinetic kill space weapons (such as ASAT missiles), stating that “[i]t would be hugely disadvantageous for the U.S. to get into that game.”\(^ {37}\) Laser systems have reportedly been tested by China, and include varying power levels to cause either electronic disruption, minor surface damage, or significant electromagnetic damage to enemy satellite technology – all without firing a missile into space.\(^ {38}\) In contrast to ASAT missiles which are obvious when launched, provocative in nature and have the potential to be intercepted, ground-based laser ASAT systems are stealthy, imperceptible, non-intrusive and critically do not create space debris. The use is contentious nonetheless.

5. **Sources of Law**

With this background information, it is essential to assess the status of international treaty law and international humanitarian law as they relate to the weaponization of space.

a. **The Outer Space Treaty (OST)**

The *Outer Space Treaty*, formally the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, forms the basis of international space law and entered into force on October 10, 1967.\(^ {39}\) To date, 100 countries are parties to the treaty, while another 26 have signed the treaty but have not completed ratification. Writing in the *Harvard Law and Policy Review*, author Joanne Gabryniewicz notes that it was a “scant ten months from the end of Outer

\(^{35}\) Space Security, supra note 4 at 141.


\(^{37}\) Koplow, supra note 14 at 1196.

\(^{38}\) Ibid. at 1198.

\(^{39}\) OST, supra note 6.
Space Treaty negotiations to its entrance into force in 1967... the speed with which the international community established this treaty regime demonstrates a clear intent that \textit{space was to be governed by international law.}^{40} This is an important consideration with respect to this paper’s proposed international ban on ASAT and space weapons, set out later.

Among the \textit{OST}'s principles, State Parties to the \textit{OST} are barred from placing nuclear weapons or any other weapons of mass destruction in orbit of Earth, installing them on the Moon or any other celestial body, or to otherwise station them in outer space.\textsuperscript{41} Further, that outer space “shall be free for exploration and use by all States without discrimination;”\textsuperscript{42} “that outer space is not subject to national appropriation by claim of sovereignty or other means;”\textsuperscript{43} and that States shall carry on their activities in the exploration and use of outer space “in accordance with international law, including the \textit{Charter} of the United Nations.”\textsuperscript{44}

Notably, the \textit{OST} does \textit{not} prevent the stationing of non-nuclear weapons in space, including conventional ASAT weapons. Article VI states that the \textit{OST} does not “affect a nuclear weapon that makes only a temporary transit of outer space, as when propelled by an intercontinental ballistic missile (ICBM) toward its target, rather than being “stationed” in space.”\textsuperscript{45} However, as Major Bellflower notes in the \textit{Air Force Law Review}, the “peaceful purposes” of Article IV “engenders considerable debate over whether it should be interpreted to refer to ‘non-military’ or ‘non-aggressive’ or ‘non-hostile’. The United States has consistently taken the latter position.”\textsuperscript{46} The \textit{OST}, ultimately, only bans weapons activities on the moon, and leaves unrestricted any imaginable non-nuclear activity, including weapons tests, in the ‘space’ around the earth. It is noteworthy that it took a full ten years after the

\textsuperscript{40} Joanne Irene Gabrynowicz “One Half Century and Counting: The Evolution of U.S. National Space Law and Three Long-Term Emerging Issues” (Summer 2010) 4 Harvard Law & Policy Review 405 at 422. [Emphasis added.]
\textsuperscript{41} \textit{OST}, supra note 6 at article I.
\textsuperscript{42} \textit{Ibid.}
\textsuperscript{43} \textit{Ibid.} at article II
\textsuperscript{44} \textit{Ibid.} at article III.
\textsuperscript{45} \textit{Ibid.} at article IV.
launch of Sputnik 1 for the international community to establish a treaty for the preservation of outer space. With that said, Koplow notes that “many of the treaty's provisions, including most of the key “constitutional” postulates that characterize the realm, had likely been established as CIL well before 1967”, particularly referencing successive UNGA resolutions on rules for the use outer space, such as the 1963 Outer Space Declaration.47

b. Space Preservation Treaty 2006

The Space Preservation Treaty (SPT) was tabled at the United Nations in 2006 and sought to ban on all weapons and warfare in space. The proposed treaty built on a 2001 UN General Assembly Resolution that declared:

“The exploration and use of outer space … shall be for peaceful purposes and shall be carried out for the benefit and in the interest of all countries, irrespective of their degree of economic or scientific development. … [The] prevention of an arms race in outer space would avert a grave danger for international peace and security.”48

However, three countries, most notably the United States, abstained from voting on most provisions of this treaty because the proposed treaty allegedly did not do enough to clearly define what is meant by a ‘space weapon’, and therefore was open to wide interpretation and impossible to verify whether it was being violated. Discussed under the banner of the “Prevention of an arms race in outer space” (PAROS), the SPT was never ratified.49 The SPT is representative of the difficulty likely to be encountered by a proposed treaty to ban ASATs.

c. U.S. National Space Policy 2010 vs 2006

Accordingly, the United States’ current National Space Policy (2010) does not explicitly preclude the development of weapons for use in space. The policy declares that:

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The United States will employ a variety of measures to help assure the use of space for all responsible parties, and, consistent with the inherent right of self-defense, deter others from interference and attack, *defend our space systems and contribute to the defense of allied space systems*, and, if deterrence fails, defeat efforts to attack them.\(^{50}\)

This policy of ‘self-defence’ would presumably include the right of the United States to shoot down enemy satellites or space-based weapons systems that threatened American space systems and satellites, and would arguably justify the use of ASATs.

The Obama administration’s policy is in contrast to the space policy set out during the Bush administration, which declared the following, with this author’s emphasis added:

> The United States considers space capabilities -- including the ground and space segments and supporting links -- vital to its national interests. Consistent with this policy, the United States will: preserve its rights, capabilities, and freedom of action in space; dissuade or deter others from either impeding those rights or developing capabilities intended to do so; take those actions necessary to protect its space capabilities; respond to interference; and *deny, if necessary, adversaries the use of space capabilities hostile to U.S. national interests*;\(^{51}\)

Presumably, the Bush administration’s policy could have also deemed foreign satellites to be potentially ‘hostile to U.S. national interests’ and thus would justify the use of ASAT systems. Arguably the world’s foremost satellite superpower has a significant national interest in protecting its 440+ satellites in global orbit.

**6. International Humanitarian Law and ASAT Weapons**

Until now, this paper has focused on providing an objective assessment of ASAT weapons, including their development, type and use, as well as the general law of outer space. All of this ties to the primary argument of this paper, and serves to frame an assessment of how IHL applies to ASAT weapons. This analysis is particularly relevant given that ASAT weapons have not been employed in combat to date. Through an assessment of

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50 US National Space Policy 2010, supra note 3 at 3 (emphasis added).
IHL, it will become clear that the use of ASAT weapons and space-based drone bombers will negatively impact the application of IHL, by reducing the ability of States to assess the proportionality, distinction and military necessity of such attacks in the event of war. It is necessary then to critically analyze principles of IHL, in order to appreciate this argument.

a. Additional Protocol 1 of the Geneva Convention

Additional Protocol I (AP1) of the Geneva Convention seeks to “reaffirm and develop the provisions [of the Geneva Convention] protecting the victims of armed conflicts”. AP1 is the premier source of IHL within which ASAT weapons and space-based drone bombers can be assessed. Further, understanding how AP1 applies will show how ASAT weaponry, when used in conjunction with coordinated cyber attacks, has the potential to rapidly cripple vital civilian infrastructure, and thus harm civilian populations, breaching various sections of AP1.

b. AP1 Article 35: “Basic Rules” – Unlimited Space Warfare?

Foremost, article 35 of AP1 establishes the “Basic rules” of armed conflict, and subsection 1 establishes that:

“the right of the Parties to the conflict to choose methods or means of warfare is not unlimited.”

Moreover, particularly relevant to ASATs, subsection 2 sets out that States are:

“prohibited to employ weapons, projectiles and material and methods of warfare of a nature to cause superfluous injury or unnecessary suffering.”

The use of ASAT weapons in warfare would potentially constitute a violation of art.35. If a state were to launch a full-scale, successful ASAT attack on an enemy’s satellite network in 2011, such an attack would also likely have a massively crippling effect on that countries’ civilian population. This attack would arguably breach art.35(1) and (2) of AP1 because nearly

52 AP1, supra note 5.
53 Ibid. at art.35 (1), (2).
every major civilian communication system today is dependent on satellites, and because many satellites serve both civilian and military purposes, bringing article 52 of AP1 into consideration as well (assessed later). In sum, the consequences of a ‘simple’ ASAT attack could potentially open up the prospect of “unlimited” warfare, the type of warfare which is sought to be barred under art.35(1). The offensive targeting of a countries’ complete satellite system would be a scenario more akin to a Cold War era nuclear exchange than any other type of warfare, given the likelihood of widespread damage. As such, it is evident that if attacked with ASAT weapons, countries would have difficulty assessing the proportionality of the attack and the necessity of their response, creating further instability.

To appreciate this argument, consider that modern society has exponentially increased its dependence on cell phones, GPS and the internet, and developed a disproportionate dependence on the wireless technology that is facilitated by satellite communications, particularly in the developing world. Attacks that target vital satellite communications systems could quite literally revert decades of progress in these developing countries. As such, the successful destruction of even 20% of a nation’s satellite infrastructure could prove catastrophic for the basic functioning of a country, since it would take years, if not decades, to restore the same cumulatively-built satellite communications capacity assembled over many years of expensive satellite launches.

c. Hypothetical: U.S.-China ASAT Missile Exchange over Taiwan

To help illustrate this point, consider the following hypothetical conflict. It can be argued that in the event of a conflict over Taiwan between the United States and China, one of the most effective means of disadvantaging the enemy would be to completely destroy or disable
their military communications system and the cellular networks provided by satellites. The United States would seek to disable Chinese surveillance satellites over Taiwan, and similarly, China would seek to destroy the United States’ surveillance and targeting capabilities. Similarly, disabling an enemy’s global positioning systems would nullify the targeting capabilities of numerous missile systems, and greatly inhibit the ability to locate both friend and foe on the battlefield. It is also important to recognize that the use of ASAT systems in full-scale war would likely form just one component in an attack designed to cripple national infrastructure, and would in all probability include cyber attacks designed to simultaneously destroy other essential pieces of communications infrastructure. The use of ASAT systems in war would likely have a cascading, destabilizing effect on the global order. In the context of IHL, a successful attack by a single ASAT missile which destroyed a countries’ communications system would make it technologically and logistically difficult for that country to assess the necessity of the enemy's ASAT strike. Once again, it would be extremely difficult to determine the appropriate, proportional military response.

d. AP1 Article 36: “New Weapons”

While ASAT weapons are not technically ‘new’ weapons systems, the potential use and threat posed by the potential proliferation of ASATs is greater than ever due to global dependence on satellite communication systems. Moreover the reality that many other countries such as China are actively developing ASAT capabilities raises concerns about the consequences of their use during warfare. Art.36 of AP1 establishes rules for the “the study, development, acquisition or adoption of a new weapon, means or method of warfare,” and specifically makes clear that countries are “under an obligation to determine whether its

employment would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party." This ‘new weapons’ provision is contentious with respect to IHL because of the absence in international law of an explicit prohibition on the weaponization of space, which was established through an assessment of the Outer Space Treaty. As such, the development and forward deployment of ASAT weapons systems today (aboard naval ships and submarines, primarily) could contravene art.36 of AP1, given the presently unregulated standards on ASAT weaponry. The pressing need, as will be assessed later, is for the international community to establish a treaty prohibiting the use of ASATs, one similar in nature to the chemical weapons ban, in order to outlaw the use of offensive ASAT weapons systems.

One aspect of ASAT use that may fall under the purview of art.36 is the ongoing development of ground-based laser ‘directed energy’ ASAT systems, which have yet to be deployed in any known capacity. As such, if a country possessed both missile and laser ASAT systems, and both are equally effective at performing an ASAT mission, then the country should employ a ‘necessity’ standard to help dictate the choice between them. Specifically, if a laser ASAT is available, and is equally effective, then employment of the missile-based interceptor technology (which creates hazardous space debris), is no longer “necessary.” As Koplow succinctly notes, “Where a State can effectively neutralize an enemy’s satellite via mechanisms that do not impose the persistent debris harm to the peaceful space activities of future generations of civilians and neutral States, customary [IHL] would outlaw the use of an interceptor.”

57 AP1, supra note 5 at article 36(1).
58 Space Security, supra note 4 at 128.
59 Bellflower, supra note 45 at 115.
60 Koplow, supra note 14 at 1210.
e. Distinction: AP1 Article 48 and Art. 52(2): “General Protection Against Effects of Hostilities” and “Attacks must be limited to military objectives”

Article 48 of AP1 establishes the “General Protection” of the civilian population against the effects of hostilities, requiring that “Parties to the conflict shall at all times distinguish … between civilian objects and military objectives and accordingly shall direct their operations only against military objectives.”61 Because many civilian satellites can be ‘retained’ for military objectives at the request of a government, such as in 2001 when the U.S. government purchased all commercial satellite imagery over Afghanistan to supplement its own spy surveillance,62 the lines between civilian and military objectives are blurry when it comes to satellites. This unclear distinction makes adherence to article 52(2) of AP1 exceptionally difficult when a state considers deploying ASAT weapons. Article 52(2) makes explicit that:

“Attacks shall be limited strictly to military objectives. In so far as objects are concerned, military objectives are limited to those objects which by their nature, location, purpose or use make an effective contribution to military action and whose total or partial destruction, capture or neutralization, in the circumstances ruling at the time, offers a definite military advantage.”63

However, in practice, the unclear distinction between civilian and military objectives may in reality result in the creation of a deterrent effect against the use of ASATs. Indeed, over the last few wars involving major powers, the 1991 Gulf War, the 2001 War in Afghanistan, the 2003 Iraq War and the Russia’s 2008 War in South Ossetia, satellites were not targeted for attack. However, as Koplow notes in those cases the major power’s “one-sided technological edge… obviated any reason to exercise weapons in space,” and moreover the “asymmetrical nature of each country’s military assets and vulnerabilities provided little occasion to shoot at objects in space.”64 Nonetheless, the targeting of satellites that are used exclusively for

61 AP1, supra note 5 at Article 48.  
63 AP1, supra note 5 at Article 52(2).  
64 Koplow, supra note 14 at 1210.
military purposes only can also, theoretically, be justified under article 52, potentially leading to increased instability during combat.

In explaining how an ASAT attack may be justified, Koplow notes that the laws of armed conflict “[d]o not prohibit all ‘collateral damage’ harm to civilians--that would probably be an impossible goal in any realistic military engagement--but it is axiomatic that force may lawfully be directed only at military objectives.”65 With respect to ASAT’s, Koplow nonetheless emphasizes that “a weapon system that is inherently incapable of that degree of finesse …is illegal,” such as a chemical weapon. Such weaponry has been banned because the user of the weapon cannot control “or even reliably predict” where the effects of the weapon may be felt, and thus it fails to meet the standards set out in AP1. In contrast, an ASAT weapon is quite discriminating and are aimed “with exquisite precision”66 at a specific enemy satellite. Indeed, a whole barrage of ASATs would be steered by sophisticated guidance systems to target particular hostile spacecraft one by one. This precision makes their utility more valuable in the eyes of military planners seeking to adhere to IHL.

f. Article 51: Protection of the civilian population

Article 51 establishes that civilians shall “enjoy the general protection against dangers arising from military operations.”67 While this article generally applies to ground warfare and the threats posed by indiscriminate aerial bombardment, it can be argued that attacks on civilian satellites would represent an indirect targeting of civilian populations, by disrupting components vital to life. Any sort of coordinated ASAT attack on cellular communications satellites would likely shutdown emergency services, everyday business operations and lead

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65 Koplow, supra note 14 at 1212.
66 Ibid.
67 AP1, supra note 5 at Article 51.
to a loss of life. The threat to civilians is made even greater in the event that ASAT attacks are launched alongside massive cyber-attacks that target other vital national infrastructure.

Koplow stresses that countries must consider the potential harm to civilians and the proportionality of the attack before utilizing ASAT weapons in combat. With respect to IHL, he notes that an “ASAT operation--especially one that might spawn a persistent debris hazard--is vulnerable under this analysis.” However, before launching an ASAT operation the proportionality calculus of military strategists would be intrinsically complicated by the fact that the military value of enemy satellites would be very high. This is true given the reality that modern enemy forces are heavily reliant on its satellites for reconnaissance, communications, and targeting systems. Moreover, for weaker nations with lesser satellites capabilities, such as Iran today, Koplow suggests that if these countries possess “few alternative ‘fallback’ substitutes, then destruction of one (or a few) orbiters could carry a significant premium” for the aggressor employing ASATs. This reality makes the military necessity of ASAT weapons’ use particularly difficult in the heat of combat.

g. Article 56: “Protection of works and installations containing dangerous forces”

In February 2008, the United States used a sea-launched ASAT missile to shoot down a non-functioning U.S. National Reconnaissance Office (NRO) satellite named USA-193, whose orbit was decaying by 500m per day. The US Government claimed that the primary reason for destroying the satellite was the approximately 1,000 lb (450 kg) of toxic hydrazine fuel contained on board, and the resulting health and environmental risks posed to persons in the immediate vicinity of the crash site should any significant amount

69 Koplow, supra note 14 at 1213.
71 AP1, supra note 5 at Article 55.
survive the re-entry.\textsuperscript{72} Though critics allege this American ASAT test was simply a response to China’s 2007 ASAT test and had nothing to do with the threat posed to humans, the test highlights the responsibilities of countries set out under article 56 of AP1. Article 56 lists strategic sites that contain “dangerous forces” that “shall not be made the object of attack… if such attack may cause the release of dangerous forces and consequent severe losses among the civilian population.”\textsuperscript{73}

Though the threat of large civilian losses on the ground caused by ASAT attacks is likely minimal due to the fact that most satellite debris stays in orbit or burns up on re-entry, the reality is that satellites, like the USA-193, are constructed out of toxic materials and pose an environmental threat upon being shot down over civilian populations. This is more so true when satellites are shot down in significant numbers, in the event of full-scale ASAT attack designed to completely annihilate an enemy’s satellite capacity. Given that article 57 of AP1 also requires States to take “precautions”\textsuperscript{74} to spare civilians before attacking, international humanitarian law brings pressure to consider all of the implications of ASAT strikes.

7. Comparative Analysis and Policy Recommendations

a. The Chemical Weapons Convention ban on chemical warfare

The integral nature of satellites to modern life, the potential destabilizing effect of ASAT use and the unavoidable threat of space debris, collectively legitimate a push toward a global ban on the use of ASAT weapons and space-based drone bombers in war. The precedent for such a ban has been set out by the Chemical Weapons Convention,\textsuperscript{75} and offers an important comparative analysis tool in consideration of a potential ban on conventional weapons in

\textsuperscript{72} US ASAT Test 2008, \textit{supra} note 70.
\textsuperscript{73} AP1, \textit{supra} note 5 at Article 56.
\textsuperscript{74} \textit{Ibid.}, at Article 57.
space. For decades chemical weapons have been researched, developed, tested, manufactured, deployed, used, and retired by many countries in diverse settings, despite the fact that public opinion has always recoiled at the prospect of chemical warfare.

Some of the earliest arms control treaties, including the Brussels Declaration of 1874 and the Hague Conventions of 1899 and 1907, for example, were developed with these hated weapons in mind. By 1925, the Geneva Protocol achieved consensus on chemical weapons, with the parties declaring that “the use in war of asphyxiating, poisonous or other gases . . . has been justly condemned by the general opinion of the civilized world; and . . . to the end that this prohibition shall be universally accepted as a part of International Law, binding alike the conscience and the practice of nations.” The Chemical Weapons Convention, which came into effect in 1993, was the culmination of decades of efforts to ban chemical weapons. But prior to 1993, customary international law had long established that chemical weapons were an especially horrific form of warfare, with numerous statements and resolutions from the UN General Assembly attesting to this. Similarly, existing opposition toward ASAT weapons and the weaponization of space could lead to the development of an ASAT and Space Weapons Ban. However, unlike chemical weapons, which merely comprised a type of ground weaponry that was obviously detrimental to basic human health interests, space weapons represent not only a new type of weaponry, but also the vanguard of an entirely new theatre of warfare. The feasibility of a space weapons ban may hinge on whether or not countries are willing to cede the exoatmospheric realm to the international collective.

76 Declaration on the Use of Projectiles the Object of Which Is the Diffusion of Asphyxiating or Deleterious Gases, July 29, 1899, Jul. 29, 1899, 32 Stat. 1803.
77 Regulations Respecting the Laws and Customs of War on Land, Hague Convention Respecting the Laws and Customs of War on Land art. 23(a), Oct. 18, 1907, 36 Stat. 2277, 1 Bevans 631 (“[i]t is especially forbidden to employ poison or poisoned weapons.”).
b. Feasibility of an 'Anti-Satellite and Space Weapons Ban'

While a public revulsion to space weaponry may not exist the same way that it does for chemical weapons given the "bloodless" and largely experimental nature of space weaponry today, there are many reasons to believe that an 'ASAT and Space Weapons Ban' may be a feasible international pursuit. Foremost, as established earlier in this paper, the universal, indiscriminate threat of space debris created by ASAT explosions gives every country on earth reason to oppose the potential weaponization of space. The accordant potential for widespread harm to civilian populations resulting from the destruction of satellites is a tangible global issue, one which could be persuasively argued in the appropriate international fora.

Second, the relative ease of which space-based weapons can be tracked by enemy powers, as evidenced by the publicly tracked U.S. X-37B 'space bomber' test, makes their usefulness marginal in comparison to more stealthy, non-space-based Air Force alternatives. While the qualitative military advantage offered by space-based weapons to the major military powers is undeniable, countries like the United States recognize that 'arming the atmosphere' will likely lead to rival powers doing the same, escalating a new 'arms race' and destabilizing the planet. Finally, in the event of war, the reciprocal nature of an offensive ASAT missile exchange, when combined with the immense costs and significant length of time needed to place new satellites orbit, together represents an intractable barrier toward the active deployment of ASAT systems internationally.

c. Parallels between Chemical Weapons Ban and Potential Space Weapons Ban

The parallels between the chemical weapons ban effort in the twentieth century and the ASAT case in the twenty-first century are striking. As Koplow comprehensively details the parallels in his article on ASATs, in both instances:

80 Bloodless weapons, supra note 20 at 157.
“a widely reviled weapon had earned significant international opprobrium, with experts and the knowledgeable public considering that form of combat to be shortsighted and reprehensible;

simultaneously, the weapons were recognized as powerful, potentially decisive in combat, or at least capable of greatly disrupting a country’s planned military activities (and, perhaps, the weapons seemed to confer more advantage on an offensive attacker, with less utility for a defender);

the weapons had proliferated and threatened to spread further (while at the same time, the leading military powers (the United States, the Soviet Union/Russia, and in the case of ASAT, China) possessed by far the greatest inventories, experience, and capacity);

the weapons were extremely imprecise and indiscriminate, with effects spreading unpredictably far from the intended targets, irresponsibly afflicting civilians and neutrals alike;

the effects of the weapons were notoriously persistent (some CW linger on, and around, the battlefield for a worrisome length of time--but nothing like the decades of danger posed by ASATs);”

It is therefore reasonable to believe that an ASAT and Space Weapons Ban is an achievable international objective. The hesitancy of countries to further test ASAT missile systems due to the space debris created also lends weight behind a push to ban these weapons altogether.

d. ASAT and Space Weapons Ban Discussions to Date

The United States recently entered into discussions with the European Union toward the development of an agreement limiting their use of anti-satellite weapons, with the joint primary concern being the prevention of further debris creation in space. However, outside of perennial non-binding UN General Assembly resolutions toward the “Prevention of an Arms Race in Outer Space” (PAROS), there is no global movement toward a ban on the weaponization of space. As Koplow notes, part of the problem is the sheer complexity of the issues, the “multiplicity of national and commercial interests at play, and the range of competing priorities occupying negotiators’ attentions.” Another major hurdle has been the persistent inability of leading authorities in Washington, D.C. and Moscow to decide

81 Koplow, supra note 14 at 1216.
83 Koplow, supra note 14 at 1198.
whether a system of mutual restraint, or a strategy of unilateral advantage-seeking, offers a better approach to security in space.” With that said, these challenges should not be viewed as insurmountable hurdles, as the success of the Chemical Weapons Convention today emphasizes the ability to States to overcome differences in the pursuit of the greater good.

8. Conclusion

The use of ASAT weaponry in combat and the potential use of space-based drone bombers threaten to contravene IHL, cause widespread harm to civilian populations and thus escalate conflicts, and as such, should be treated like WMD’s. Given the nearly unstoppable advance of modern military technology, if space weapons are not banned, countries will be forced to build satellites equipped with counter-measures that destroy incoming ASAT missiles – and as a consequence, effectively guarantee the permanent weaponization of space. At that point, there exists only a small leap in logic between the prospects of satellites armed with missiles for self-defence, to satellites (or space-bombers/orbiters) armed with missiles and bombs for offensive purposes. Further, the potential widespread use of ground-based ASAT lasers threatens to disrupt national satellite communication networks, in an undetectable, stealthy manner, which threatens to cause mass civilian losses in war.

In sum: the weaponization of space offers only a bleaker future, represents an abuse of modern technology and is an unnecessary step into the unknown for all countries. International legal norms provide more than sufficient precedents for the creation of an ‘ASAT and Space Weapons Ban’, as the assessment of the Chemical Weapons Convention exemplified. Weapons in space must be contained because the potential for disaster is enormous. Humanity’s beneficial use of space has become too entrenched to passively allow weapons that in an instant could erase decades of peaceful development and coexistence.