OPERATING IN A VOID: LIMITATIONS OF THE LAW OF ARMED CONFLICT AND THE NEED FOR UPDATED LEGAL PROTECTIONS IN OUTER SPACE

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The dinosaurs disappeared because they could not adapt to their changing environment. We shall disappear if we cannot adapt to an environment that now contains spaceships, computers—and thermonuclear weapons.[1]

INTRODUCTION

The importance of outer space as a neutral and freely traversable zone for communication and technology cannot be overstated. Systems currently in orbit facilitate almost every aspect of the global economy, from credit card transactions to commercial navigation to nearly every digital form of communication.[2] Outer space exploitation also facilitates military functions like communication and navigation.[3] Indeed, the United States ("U.S.") military relies on systems in outer space for its most critical national

[1] *Arthur C. Clarke*, ECONOMIST (Mar. 27, 2008), https://www.economist.com/obituary/2008/03/27/arthur-c-clarke.
[2] *See* David A. Koplow, *The Fault is Not in Our Stars: Avoiding an Arms Race in Outer Space*, 59 HARV. INT'L L.J. 331, 334 (2018).
[3] Bradley Bowman & Jared Thompson, *We Must Work to Prevent a "Space Pearl Harbor,"* DISPATCH (Feb. 18, 2021), https://thedispatch.com/article/we-must-work-to-prevent-a-space-pearl/; *see also* U.S. DEP'T OF DEF., 2022 NATIONAL DEFENSE STRATEGY OF THE UNITED STATES OF AMERICA 8-10 (OCT. 27, 2022) [hereinafter DOD DEFENSE STRATEGY].

defense functions,[4] including missile defense, naval operations of all stripes, land navigation, targeting, and weather forecasting.[5]

As the U.S. military increasingly leverages systems in outer space, it faces a "pacing challenge" from the People's Republic of China ("P.R.C.") in space and other domains.[6] While the U.S. built solutions for counterinsurgency warfare, the P.R.C. prioritized mitigating the U.S. military's advantages in international conflict, to include investing heavily in space.[7] Thus, the past two decades have seen an unprecedented expansion of Chinese capability in space.[8] Such developments threaten the U.S.' strategic advantage in space because what was once a domain monopolized by the U.S. is now shared with the P.R.C. as a major spacefaring nation.[9] Although armed conflict is

[4] FRANCIS LYALL & PAUL B. LARSEN, SPACE LAW: A TREATISE 472 (2d ed. 2018); Sec'y of the Air Force Pub. Affs., *Saltzman Highlights New Space Force Mission Statement and Building a Purpose-Built Service for Great Power Competition*, U.S. SPACE FORCE (Sep. 12, 2023), https://www.spaceforce.mil/News/Article-Display/Article/3523076/saltzman-highlights-new-space-force-mission-statement-and-building-a-purpose-bu/; *see* U.S. DEP'T OF AIR FORCE, REPORT TO CONGRESSIONAL COMMITTEES, COMPREHENSIVE STRATEGY FOR THE SPACE FORCE 4 (Aug. 15, 2023) [hereinafter AIR FORCE STRATEGY REPORT].

[5] *See* DOD DEFENSE STRATEGY, *supra* note 3, at 10; LYALL & LARSEN, *supra* note 4, at 465-67; Jon Gertner, *What Does the U.S. Space Force Actually Do?,* N.Y. TIMES (Nov. 8, 2023), https://www.nytimes.com/2023/11/08/magazine/space-force.html.

[6] *See* U.S. DEP'T OF DEF., ANNUAL REPORT TO CONGRESS, MILITARY AND SECURITY DEVELOPMENTS INVOLVING THE PEOPLE'S REPUBLIC OF CHINA I (2023) [hereinafter PRC MILITARY DEVELOPMENTS REPORT]; DOD DEFENSE STRATEGY, *supra* note 3, at 4.

[7] *See* DEP'T OF AIR FORCE, *Department of the Air Force Operational Imperatives*, https://www.af.mil/Portals/1/documents/2023SAF/OPERATIONAL_IMPARITIVES_INFOGRAPHIC.pdf (last visited Nov. 11, 2024); PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 70.

[8] *See generally* David Chen, *China's Space Capability and What This Means for the West*, CHINA AEROSPACE STUD. INST. (June 3, 2024), https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/Space/2024-06-03-2%20Chinas%20Space%20Capability%20and%20what%20it%20means%20for%20the%20West.pdf; PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 72.

[9] *See War in Space: Gathering the Guardians*, ECONOMIST, Feb. 3, 2024, at 55 [hereinafter *Gathering the Guardians*]; DOD DEFENSE STRATEGY, *supra* note 3, at 4; *see also* LYALL & LARSEN, *supra* note 4, at 478.

not inevitable, potential armed conflict with the P.R.C. will likely be fought partially in the space domain.[10]

Should armed conflict erupt in space, there is a gap between the minimum protections existing treaties and the law of armed conflict ("LOAC") provide and the potential for catastrophic damage to the U.S.' warfighting advantage and civilian applications of space.[11] This Article addresses the LOAC's principles of distinction and proportionality as applied in the space domain.[12] The recognized and customary principles of distinction (the requirement for military commanders to distinguish military targets from civilian targets)[13] and proportionality (the requirement for military commanders to weigh the military advantage of destroying a target against the loss of civilian life or infrastructure)[14] are significantly complicated beyond the limits of the atmosphere. As this Article will explore, State utilization of dual-use satellites and spacecraft (e.g., communications systems used by civilian and military organizations) makes distinction, as currently defined, impossible in many cases.[15] The current orbital environment

[10] *Gathering the Guardians*, *supra* note 9.

[11] *See* ANJA NAKARADA PECUJLIC, THE SPACE LAW STALEMATE: LEGAL MECHANISMS FOR DEVELOPING NEW NORMS 21-22 (2022); *see also* Charles S. Galbreath, *Building U.S. Space Force Counterspace Capabilities: An Imperative for America's Defense*, MITCHELL INST. FOR AEROSPACE STUD., June 2023, at 22.

[12] The five recognized principles of LOAC, are military necessity, humanity, proportionality, distinction, and honor. OFF. OF GEN. COUNS., U.S. DEP'T OF DEF., DEPARTMENT OF DEFENSE LAW OF WAR MANUAL § 2.1.2.3 (June 12, 2015) (C4, July 31, 2023) [hereinafter LAW OF WAR MANUAL] ("*Military necessity* justifies certain actions necessary to defeat the enemy as quickly and efficiently as possible. Conversely, *humanity* forbids actions unnecessary to achieve that object. *Proportionality* requires that even when actions may be justified by *military necessity*, such actions not be unreasonable or excessive. *Distinction* underpins the parties' responsibility to comport their behavior with *military necessity, humanity,* and *proportionality* by requiring parties to a conflict to apply certain legal categories, principally the distinction between the armed forces and the civilian population. Lastly, *honor* supports the entire system and gives parties confidence in it.") (emphasis in original) (citations omitted).

[13] LAW OF WAR MANUAL, *supra,* note 12, § 2.5.

[14] LAW OF WAR MANUAL, *supra* note 12, § 5.10.

[15] *See, e.g.,* Koplow, *supra* note 2, at 347; Stephen Clark, *Space Force Chief Says Commercial Satellites May Need Defending,* ARS TECHNICA (Sep. 25, 2023, 8:25 PM), https://arstechnica.com/space/2023/09/space-force-chief-foresees-role-in-protecting-commercial-satellites/; INT'L COMM. OF THE RED CROSS, *The Potential*

is getting more crowded and potentially contested, often on a daily basis.[16] The difficulty of distinguishing military from civilian assets (and the proportionality concerns of attacking space systems civilians also rely on) calls for a uniform, internationally agreed-upon system of rules. Part V discusses how such a system of rules would provide a framework for current and future spacefaring nations to avoid needless civilian harm in the space domain during armed conflict.

Part II of this Article discusses current capabilities and vulnerabilities inherent in State dependence on space and, due to that increasing dependence, the growing potential for conflict in the space domain. Part III overviews the LOAC principles of distinction and proportionality in the space domain as they relate to the activities and viewpoints of the P.R.C. as the U.S.' closest competitor. Part III also discusses the burgeoning field of dual-use systems and how they complicate the distinction and proportionality calculus. With this context, Part IV explores why the LOAC and international law's limitations, as well as the positions advanced by the P.R.C. and its allies, make the current legal framework insufficient to protect U.S. satellites and civilian infrastructure. After discussing the void between the potential consequences of war in space and the current legal structure's protections, this Article addresses the future in Part V. The future requires an internationally recognized system of rules (written or customary) that acknowledges the militarization of space and accounts for the domain's unique challenges, including the potentially catastrophic results of satellite destruction, difficulties with the distinction between military and civilian targets, and the speed at which decisions must be made to preserve space superiority.

I. BACKGROUND

Prior to discussing the present and future of LOAC principles in space, it is necessary to understand the current operating environment in the domain. This section illuminates the current civilian utilization of space, U.S. military applications, P.R.C. space

Human Cost of the Use of Weapons in Outer Space and the Protection Afforded by International Humanitarian Law: Position Paper, 915 (2021).

[16] *See* STEPHEN M. MCCALL, CONG. RSCH. SERV., IF10337, CHALLENGES TO THE UNITED STATES IN SPACE 2 (2020); Clark, *supra* note 15.

capabilities, and where there is potential for competition or outright conflict in orbit.

A. *Civilian Utilization of Space*

The 21st century has witnessed the international economy and American trade moving from heavily reliant to completely dependent on satellites for communication and logistics.[17] As David Koplow wrote in 2018, civilian use of satellites is ubiquitous and so fundamental to daily life that "people seem to notice the service mechanisms only when they are interrupted."[18] One such fundamental service mechanism is Global Positioning System ("GPS"), which is a U.S. government system.[19] But GPS is so integrated in civilian applications—including communications, banking, farming, logistics, and power grids—that it can be said to affect "every aspect of modern life."[20]

Investment in and growth of the space industry to accommodate commercial applications have been rapidly increasing in recent decades. From 2013 to 2023, the value of the global space economy grew approximately ninety-one percent.[21] According to the nonprofit Space Foundation, the value of the global "space economy"

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[17] *See* Koplow, *supra* note 2, at 334; MCCALL, *supra* note 16, at 1.

[18] Koplow, *supra* note 2, at 334.

[19] *See* Almudena Azcárate Ortega, *Not a Rose by Any Other Name: Dual-Use and Dual-Purpose Space Systems*, LAWFARE (June 5, 2023, 8:15 AM), https://www.lawfaremedia.org/article/not-a-rose-by-any-other-name-dual-use-and-dual-purpose-space-systems; Charles Beames, *A Day Without Space: GPS is Ground Zero for the New Space Race*, FORBES (Sep. 29, 2023, 10:45 AM), https://www.forbes.com/sites/charlesbeames/2023/09/29/a-day-without-space-gps-is-ground-zero-for-the-new-space-race/?sh=e08111f42101.

[20] *GPS Applications*, *GPS.GOV*, https://www.gps.gov/applications/ (last modified Nov. 25, 2014).
The list of applications above is an extremely small sample of space functions in daily life, of which GPS itself is but one part. Other publications have written extensively on the myriad civilian applications of space. *See*, *e.g.,* Koplow, *supra* note 2, at 334 (providing context for critical commercial uses of space, as well as extensive citations to authorities analyzing the same).

[21] *Space Foundation Releases the Space Report 2023 Q2, Showing Annual Growth of Global Space Economy to $546B, SPACE FOUND. (July 25, 2023), https://www.spacefoundation.org/2023/07/25/the-space-report-2023-q2/.*

(the total value of public spending and commercial revenue from space assets) grew from $505 billion to $546 billion from 2021 to 2022.[22] And some estimates project the private launch services market, valued at over $8 billion in 2022 and over $9 billion in 2023, to grow to over $20 billion by 2030.[23]

That satellites are so ingrained in the global economy and modern life poses risks that concern international bodies and governments.[24] The International Committee of the Red Cross ("ICRC") notes the potentially catastrophic results of disabling "civilian or dual-use space objects."[25] Certain "civilian infrastructure needed for health care, transportation, communications, energy, and trade," depend on satellites, and damaging those satellites "could have wide-reaching consequences for civilians on earth."[26] Satellites, the ICRC notes, also "contribute to every phase of humanitarian work" and are important for navigation, timing, weather analysis, and communications, among other functions.[27] The United Nations ("U.N.") noted its concerns about orbital debris and an "arms race" in space (leading to deleterious effects on systems already described) with a resolution "[e]mphasizing the importance of maintaining outer space as a peaceful, safe . . . environment for the benefit of all . . . ."[28] Academics and policy analysts in the field have also expressed grave concern over how the loss or degradation of satellites would affect civilian life.[29]

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[22] *Id.*

[23] *Space Launch Services Market Size to Worth USD 20.54 Billion by 2023,* FORTUNE BUSINESS INSIGHTS (June 14, 2023), https://www.globenewswire.com/news-release/2023/06/14/2687981/0/en/Space-Launch-Services-Market-to-Worth-USD-20-54-Billion-by-2030-Fortune-Business-Insights.html.

[24] *See, e.g.,* Koplow, *supra* note 2, at 337-338; Caroline D. Krass, Gen. Couns., Dep't of Def., Space Law: Promoting the Rules-based Order Through Multi-Domain Lawyering (Mar. 5, 2024).

[25] INT'L COMM. OF THE RED CROSS, *supra* note 15, at 1352.

[26] *Id.* at 1352-53.

[27] *Id.* at 1353.

[28] G.A. Res. 75/36, at 1 (Dec. 7, 2020).

[29] Koplow, *supra* note 2, at 337; *see, e.g.,* PECUJLIC, *supra* note 11, at 21-22.

B. *United States Military Applications in Space*

Like the private sector (and arguably foundational for it), the U.S.' national defense utilization of outer space resources grew significantly in the twenty-first century.[30] Satellites are integral to systems across the Department of Defense ("DoD") and the intelligence apparatus.[31] Communications, logistics, and dozens of other functions would be inhibited or impossible without them.[32] This dependence, according to some experts, poses vulnerabilities.[33] In a recent report on the protection of satellites, the DoD provided general examples of military space capabilities critical to national security: "U.S. space-based capabilities —including positioning, navigation, and timing, satellite communications, missile warning and missile tracking (MW/MT), and other missions—are critical to overall military effectiveness across all domains and therefore to successful homeland defense, deterrence, and countering aggression."[34] The DoD also uses satellites to provide intelligence, surveillance, and reconnaissance ("ISR") support to its operations.[35]

As of May 2022, the U.S. has more machinery in space than any other nation; the P.R.C. has the second most. [36] The number and capabilities of U.S. military satellites (and satellites with military applications) are expected to grow significantly.[37] This growth breeds

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[30] *See* Galbreath, *supra* note 11, at 4; Koplow, *supra* note 2, at 335.
[31] Galbreath, *supra* note 11, at 2.
[32] *See* Koplow, *supra* note 2, at 335; *see* Galbreath, *supra* note 11, at 13.
[33] Koplow, *supra* note 2, at 337.
[34] U.S. DEP'T OF DEF., REPORT TO CONGRESSIONAL COMMITTEES, SPACE POLICY REVIEW AND STRATEGY ON PROTECTION OF SATELLITES 5 (Sep. 2023) [hereinafter DOD SPACE POLICY REVIEW].
[35] *See id.* at 4, 5.
[36] Katharina Buchholz, *The Countries with the Most Satellites in Space [Infographic]*, FORBES (Apr. 26, 2023, 12:01 PM), https://www.forbes.com/sites/katharinabuchholz/2023/04/26/the-countries-with-the-most-satellites-in-space-infographic/?sh=6ed07ff6ce27. Note the numbers describe both government and private commercial satellites. Regardless of private or public ownership, the U.S. has a staggering lead in number of satellites, with 3,415 known satellites to P.R.C.'s 535 as of May 2022. *Id.*
[37] *See* DOD SPACE POLICY REVIEW, *supra* note 34, at 4-8. *See generally* Koplow, *supra* note 2, at 334-337.

complexity and increased potential for negative impacts in the domain because while additional satellites may provide redundancies, they also constitute additional targets.[38] And, even assuming redundancies prevent the worst effects of an enemy attack (or another State's negligence), destroying satellites creates space debris that can have disastrous second-order effects.[39] Still, U.S. expansion in the space domain is necessary to prevent the P.R.C. from overtaking the U.S. as a leader in that sector.

C. *P.R.C. Military Applications in Space*

The P.R.C. has placed increased emphasis on competing in the space domain and gaining a foothold to compete with U.S. interests in space.[40] In pursuit of this goal, the People's Liberation Army ("P.L.A.") established a new "theater command-level organization," the Strategic Support Force, in 2015 to "centralize the [P.L.A.]'s strategic space, cyberspace, electronic, information, communications, and psychological warfare missions and capabilities."[41] Within this Force, the Space Systems Department ("S.S.D.") controls space operations, including launches and counterspace activities, which include offensive and defensive activities in orbit.[42] The S.S.D. is at the forefront of the P.R.C.'s "operational counterspace capability," which is constantly expanding and improving in line with the P.R.C.'s

[38] *See* Koplow, *supra* note 2, at 337-38; DOD SPACE POLICY REVIEW, *supra* note 34, at 10-11; Galbreath, *supra* note 11, at 4.

[39] *See* Marc G. Carns, *Consent Not Required: Making the Case That Consent Is Not Required Under Customary International Law for Removal of Outer Space Debris Smaller than 10CM*, 77 A.F. L. REV. 173, 181-84 (2017); DOD SPACE POLICY REVIEW, *supra* note 34, at 3, 10.

[40] PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at VII; *see* MARK STOKES ET AL., CHINA'S SPACE AND COUNTERSPACE CAPABILITIES AND ACTIVITIES 13 (2020), https://www.uscc.gov/sites/default/files/2020-05/China_Space_and_Counterspace_Activities.pdf (report prepared for the U.S.-China Economic and Security Review Commission explaining the P.R.C.'s view of expansion in space as a strategic imperative to continue its growth as a global power).

[41] PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 70.

[42] PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 71.

strategic goals.[43] These capabilities include "electronic countermeasures," anti-satellite missiles ("ASATs"), and developing "space-based counterspace systems" like a robotic intercept arm.[44]

1. "Military-Civil Fusion"[45]

Under the leadership of President Xi Jinping, the P.R.C. has made "military-civil fusion" a cornerstone of its space policy.[46] Indeed, nearly every aspect of the P.R.C.'s defense structure is either currently integrated or in the process of integrating with civilian industry.[47] Per the DoD, the Chinese integration of military and civil capabilities "encompasses six interrelated efforts," including combining the means of production, scientific and technological research, and human resources.[48] Chinese expansion into outer space follows this integrated defense structure, with the P.L.A. working alongside the Chinese civilian space sector to develop dual-use integrated systems and shared technologies.[49] The end result: an all-of-society approach to national defense, including in the space domain, the P.L.A. can mobilize in the event of armed conflict.[50]

The P.R.C.'s all-of-society approach encompasses every aspect of space development, from talent acquisition to manufacturing to launches.[51] On the personnel side, many leaders of the civilian space development agency ("China National Space Agency" or "CNSA")

[43] *See* STOKES ET AL., *supra* note 40, at 39-41; PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at VI.
[44] STOKES ET AL., *supra* note 40, at 39-40; *see also* Galbreath, *supra* note 11, at 7. The robotic arm in particular has caused consternation among industry and military space experts, as there are no known countermeasures currently deployable against kinetic interference in the form of robot arms in space.
[45] PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at IV.
[46] *See* PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 29, 72.
[47] PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 28.
[48] *See* PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 28, 30-32.
[49] *See* PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 31.
[50] *See* PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 32; *see also Military-Civil Fusion and the People's Republic of China*, U.S. DEP'T OF STATE (May 28, 2020), https://2017-2021.state.gov/remarks-and-releases-bureau-of-international-security-and-nonproliferation/mcf-and-the-prc/.
[51] *See* STOKES ET AL., *supra* note 40, at 59-61.

also hold leadership positions in the P.L.A.'s primary military space development agency ("State Administration for Science, Technology, and Industry for National Defense" or "SASTIND").[52] Chinese corporations are funded by state investments and share resources, human talent, launch sites, and research facilities with state-owned enterprises.[53] This blend of public and private enterprise blurs the lines of civilian versus military use of space such that the Chinese space industry is almost entirely subservient to the state's needs, including P.L.A. designs on military superiority in space.[54]

In addition to fomenting military capability by integrating commercial space activities with the state, the P.L.A. space program benefits from other nations' technologies through civilian international cooperation.[55] Although the 2011 "Wolf Amendment" prohibits U.S. agency cooperation with Chinese state space programs,[56] the P.R.C. still gleans research benefits through international cooperation—including with American, British, and Australian universities.[57] Exploiting foreign commercial and academic advances in space technologies adds to the P.R.C.'s intellectual (and literal) arsenal of space capabilities as information flows to the state (and the P.L.A.) through military-civil fusion.[58]

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[52] *Id.* at 59.

[53] *See id.* at 75-80 (describing how the allegedly private space companies, including "China's answer to SpaceX," are controlled by the CCP, funded by the state, and share resources such as launch sites and personnel with state entities).

[54] *See id.* at 59-61; PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 72.

[55] PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 72; *see Military-Civil Fusion and the People's Republic of China*, *supra* note 50 ("The CCP also exploits the open and transparent nature of the global research enterprise to bolster its own military capabilities through bodies like the China Scholarship Council, which requires academic scholarship recipients to report on their overseas research to PRC diplomats.").

[56] Department of Defense and Full-Year Continuing Appropriations Act, Pub. L. No. 112-10, 125 Stat. 123 (2011); STOKES ET AL., *supra* note 40, at 68; *see* Jeff Foust, *Nelson Supports Continuing Restrictions on NASA Cooperation with China*, SPACE NEWS (Apr. 21, 2023), https://spacenews.com/nelson-supports-continuing-restrictions-on-nasa-cooperation-with-china/.

[57] STOKES ET AL., *supra* note 40, at 68-69.

[58] *Id.* at 94.

2. China's Burgeoning Military Space Capabilities

Since the P.R.C. reorganized its space command structure in 2016, Chinese military engagement and capability in space has significantly increased year-over-year.[59] These capabilities include both defensive systems (e.g., monitoring and early-warning systems) and both space- and ground-based offensive systems (e.g., jammers, directed-energy weapons, and ASAT missiles).[60]

a. Communications, Surveillance, and Defensive Systems

The P.L.A. uses space capabilities in its intelligence and monitoring activities around the world, performing standalone operations or preparing to augment future terrestrial activities.[61] As of September 2023, the "[P.L.A.] owns and operates roughly half of the world's space-based . . . (ISR) satellites," improving its "ability to monitor forces across the globe . . . ."[62] In addition, the number of space assets and the strength of their capabilities are steadily rising with P.L.A. investment "in improving its capabilities in space-based . . . (ISR), satellite communication, satellite navigation, and meteorology, as well as human spaceflight and robotic space exploration."[63] Several Chinese satellites are dedicated to military purposes, primarily for communications.[64] Just how much of the P.L.A.'s communications network operates on domestically produced and owned (as opposed to leased) hardware and the extent to which military and civilian functions share hardware is unclear.[65]

b. Counterspace Capabilities

Chinese counterspace capabilities, especially the P.L.A. space program's increasing arsenal, have been causing widespread

[59] *See* STOKES ET AL., *supra* note 40, at 21, 101.
[60] PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 99.
[61] *See* PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 99-100.
[62] DOD SPACE POLICY REVIEW, *supra* note 34, at 2.
[63] PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at VIII.
[64] STOKES ET AL., *supra* note 40, at 35
[65] *See id.*

consternation in the national defense and legal spheres for more than a decade.[66] This consternation is well-founded, as the P.R.C.'s burgeoning counterspace program may well be able to interfere with some of the U.S. and others' most sensitive space assets.[67]

Ground-based counterspace systems likely pose the biggest threat for the kinetic destruction of satellites and the creation of space debris.[68] In 2007, the P.R.C. demonstrated this capability in spectacular fashion with an ASAT test against one of its own satellites.[69] Viewed by many in the international community as reckless, this test created a debris field of "over 3000 [debris] pieces large enough to be tracked from Earth."[70] Included in the test was a secretive "kinetic kill vehicle" designed to destroy the satellite.[71]

The primary implications of the test are twofold. First, the launch and subsequent destruction proved the P.L.A. to be an increasingly capable anti-satellite threat to not only satellites in low-Earth orbit, but also potentially to geosynchronous orbit far beyond.[72] Second, as explored in later sections, satellite destruction has second-order and LOAC implications beyond the initial loss of function from damaged hardware. In a single test, the P.R.C. created a debris cloud

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[66] *See, e.g.*, Koplow, *supra* note 2, at 340-41 ("China dramatically entered the ASAT testing business" in 2007, launching an anti-satellite test missile that resulted in over 3,000 pieces of space debris large enough to be tracked from Earth in "the single worst debris-creating incident in space history.").

[67] *Id.* at 341 (describing a 2013 Chinese test launch that nearly reached the "special geosynchronous orbit at 36,000 km, at which many of the most valuable reconnaissance and communications satellites are parked.").

[68] *See* DOD SPACE POLICY REVIEW, *supra* note 34, at 2-3; STOKES ET AL., *supra* note 40, at 22; *Gathering the Guardians*, *supra* note 9, at 56.

[69] *See* Koplow, *supra* note 2, at 340-41.

[70] *Id.* at 340-41. *See* BRIAN WEEDEN, 2007 CHINESE ANTI-SATELLITE TEST FACT SHEET 1 (Secure World Foundation 2010), https://swfound.org/media/9550/chinese_asat_fact_sheet_updated_2012.pdf.

[71] *See* WEEDEN, *supra* note 70.

[72] *See* Koplow, *supra* note 2, at 341; STOKES ET AL., *supra* note 40, at 39 (noting the continued development of ASAT technologies and the probable assumption of ASAT responsibilities by the P.L.A. Rocket Force).

with some estimations reaching 35,000 pieces of debris large enough to damage the International Space Station.[73]

In addition to kinetic threats from the ground, the P.R.C. is advancing in portable terrestrial jamming equipment, which include non-kinetic electronic countermeasure systems that can "disrupt, deny, deceive, or degrade space services."[74] These systems target satellite communications "by attacking uplinks and downlinks . . . over a large range of frequencies" and can be accompanied by cyber operations to further degrade targeted systems.[75] The DoD noted the troubling implications of these systems in a 2023 report: "The [P.R.C.]'s [electronic warfare] strategy emphasizes suppressing, degrading, disrupting, or deceiving enemy electronic equipment throughout the continuum of a conflict," including jamming of GPS satellite systems during military exercises.[76] These portable electronic countermeasure systems pose a significant threat, if effective, based on their apparent proliferation.[77]

The P.L.A. may also use orbital counterspace systems offensively against U.S. satellites.[78] Such capabilities are notoriously difficult to assess, but known projects imply the P.LA.'s increased ability to use orbital systems to interfere with, degrade, or destroy adversaries' satellites.[79] Among these systems is a successfully tested, vehicle-based "robotic arm" used on a "debris-related mission," which fostered concerns about offensive capabilities against enemy

[73] T.S. KELSO, CTR. FOR SPACE STANDARDS AND INNOVATIONS, ANALYSIS OF THE 2007 CHINESE ASAT TEST AND THE IMPACT OF ITS DEBRIS ON THE SPACE ENVIRONMENT 325 (2007), https://celestrak.org/publications/AMOS/2007/AMOS-2007.pdf.
[74] STOKES ET AL., *supra* note 40, at 39.
[75] *Id.*
[76] PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 95; *see* DOD SPACE POLICY REVIEW, *supra* note 34, at 2-3 ("The PLA is developing, testing, and fielding capabilities intended to target U.S. and allied satellites, including . . . ground-based laser systems that can disrupt, degrade, and damage satellite sensors . . . .").
[77] *See generally* PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 95; DOD SPACE POLICY REVIEW, *supra* note 34, at 2-3.
[78] PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 99, 103 ("The PRC is developing other sophisticated space-based capabilities, such as satellite inspection and repair. At least some of these capabilities could also function as a weapon.").
[79] *See* STOKES ET AL., *supra* note 40, at 39.

satellites.[80] Advanced projects also include a "space plane," which is an orbital drone capable of delivering payloads into geosynchronous orbit and potentially intercepting satellites.[81] The demonstrated capability to directly interfere with satellites in such a dynamic manner will likely foment the development of U.S. defensive space capabilities in line with the National Defense Strategy.[82] The ability to interfere directly with satellites is a recent development and may force the U.S. to install or improve countermeasures on its future satellites.[83]

D. *Current Potenial for Conflict*

Both the U.S. and the P.R.C. have increased their rate of satellite placement over the past decade, and both intend to continue at the same or increased rates.[84] As the two powers continue to vie for dominance in the space domain—increasing capabilities in areas like navigation, ISR, and communication—heightened potential for conflict and a new arms race has become apparent.[85]

Public reporting provides a grim view of potential conflict in space, including the possibility of miscalculation and subsequent escalation.[86] U.S. Space Force leadership have also expressed concern

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[80] *See Id.* at 39-40; PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 103; *see also*, Courtney Kube & Dan De Luce, *How China is Challenging the U.S. Military's Dominance in Space*, NBC NEWS (Dec. 12, 2023, 6:13 PM), https://www.nbcnews.com/politics/national-security/china-challenging-us-militarys-dominance-space-rcna128993# (describing challenges raised by the robotic arm and Chinese satellite maneuverability according to senior Department of Defense officials such as General James Dickinson, Commander, U.S. Space Command).

[81] Brett Tingley, *China's Space Plane Apparently Deployed 6 'Mysterious Wingmen' in Orbit*, SPACE.COM (Dec. 18, 2023), https://www.space.com/china-space-plane-depoyed-mystery-objects.

[82] *See* DOD DEFENSE STRATEGY, *supra* note 3, at 4, 17 (highlighting the P.R.C.'s burgeoning space capabilities and the need for better defense of U.S. space systems).

[83] *See* Kube & De Luce, *supra* note 80.

[84] *See* Buchholz, *supra* note 36; STOKES ET AL., *supra* note 40, at 15-16 (describing increasing rate of P.R.C. space placement), 19 (predicting the use of more space assets to facilitate P.L.A. global operations). *See generally* Koplow, *supra* note 2, at 334-36.

[85] Koplow, *supra* note 2, at 347.

[86] *Gathering the Guardians*, *supra* note 9, at 57.

about attacks in space.[87] Space operations are in a uniquely difficult operational space because, in many instances, combatants and potential combatants cannot necessarily "see" what is occurring or why a particular system has gone offline.[88] Indeed, even with all the tracking systems, computing power, and mathematical knowledge behind U.S. satellites, there is a fundamental issue: the U.S. cannot visualize every satellite in orbit, nor can space operators instantly get eyes on them after a possible attack.[89] This is to say nothing of the potential for attribution of an attack to an accident or the wrong perpetrator.[90]

Defense of space assets is hampered by two issues: the difficulty of (1) determining the precise cause of damage to a system and (2) attributing an attack to an adversary.[91] Determining the cause of damage to a system is not easy in an environment reliant on sensing systems that typically do not have "eyes-on" capabilities.[92] Damage determination can take time, and even confirming an accident—as opposed to an attack—requires cross-checking data sources that compile objects beyond the visual range.[93] Unlike defending objects on the ground, there is no opportunity to use multiple types of reconnaissance to determine the source of a projectile.[94] Because

[87] *Id.* at 56; Bowman & Thompson, *supra* note 3 (According to a statement by General Mark Milley, Chairman of the Joint Chiefs of Staff, "the next Pearl Harbor could happen in space").
[88] Josh Luckenbaugh, *Space Force Struggles to Track Rising Number of Objects in Orbit*, NAT'L DEF. (Apr. 19, 2023), https://www.nationaldefensemagazine.org/articles/2023/4/19/space-domain-awareness-capabilities-still-lagging-says-space-force-chief.
[89] *Id*; *see also* Galbreath, *supra* note 11, at 4 (describing the difficulties with tracking unexpected objects and delays in sensing coverage).
[90] John Klein, *To Deter Attacks on Satellites, U.S. Needs a Strategy to Identify Bad Actors*, SPACE NEWS (June 5, 2020), https://spacenews.com/op-ed-to-deter-attacks-on-satellites-u-s-needs-a-strategy-to-identify-bad-actors/; Jim Cooper, *Updating Space Doctrine: How to Avoid World War III*, WAR ON THE ROCKS (July 23, 2021), https://warontherocks.com/2021/07/updating-space-doctrine-how-to-avoid-world-war-iii/ (discussing how attribution is a stumbling block for deterrence by punishment in space).
[91] Klein, *supra* note 90; Cooper, *supra* note 90.
[92] *Gathering the Guardians*, *supra* note 9, at 56-57.
[93] Luckenbaugh, *supra* note 88; Galbreath, *supra* note 11, at 4.
[94] Galbreath, *supra* note 11, at 4.

seeing every object is impossible, space defense is like cyber warfare in that humans must rely on technology and monitoring to "see" the nature of the damage and its source.[95] These complications, though significantly ameliorated by technology, add an additional layer for information to pass through prior to actionability in the event of damage.

The more significant issue for the LOAC purposes is the difficulty of attributing intent behind a potentially offensive act in space to a particular adversary.[96] Adversaries can shield their actions behind complex systems in space or use new capabilities to deploy objects the U.S. cannot yet track or readily identify.[97] Although nations must register their space objects and take responsibility for the damage they may cause under the Outer Space Treaty (explained below), the possibility remains for clandestine placement of offensive systems.[98] As technology gets better, smaller, and more maneuverable, the possibilities for counterspace systems grow larger (along with the headaches associated with tracking them).[99] Some space objects under a certain size simply are not tracked; others are not able to be tracked.[100] These objects can still cause catastrophic damage, and one can envision the difficulties of attributing intent if a satellite is struck by a pebble-sized object.[101] In the time it takes to determine whether a strike was a piece of space debris or an intentional projectile from halfway across the globe, time may have run out for decisions about defense, retaliation, or other solutions from across the U.S. government.[102]

There is significant friction between the time it takes to attribute a potential attack and the need to initiate defenses or make

[95] Luckenbaugh, *supra* note 88; Galbreath, *supra* note 11, at 14.
[96] *See* Galbreath, *supra* note 11, at 23, 27-28.
[97] Cooper, *supra* note 90.
[98] *Id.*; *see also* Tingley, *supra* note 81; Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, art. VII, VIII, Jan. 27, 1967, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty]; LYALL & LARSEN, *supra* note 4, at 49.
[99] Galbreath, *supra* note 11, at 4.
[100] *See* KELSO, *supra* note 73; MCCALL, *supra* note 16, at 2.
[101] *Supra* text accompanying Cooper note 90.
[102] Galbreath, *supra* note 11, at 4; Luckenbaugh, *supra* note 88.

the decision to counterattack (to the extent those are separate activities).[103] Sensitive systems orbiting at thousands of miles per hour may have minutes or seconds to react to a counterspace attack, particularly one that is space-based (rather than a trackable ground-based ASAT missile).[104] But due to the difficulty of operating in the space domain, including the challenges of attribution and determining intentionality, the potential for confusion and miscalculation is high.[105] A snap decision could result in an escalation with disastrous ramifications for space assets and the universe of systems reliant on them.[106]

Some spacefaring powers have already made significant miscalculations that resulted in devastating consequences in space.[107] These have not escalated to international conflict, but they have had negative impacts that could multiply with further miscalculations.[108] The prime example of a consequential miscalculation is the P.R.C.'s 2007 ASAT test that destroyed one of its satellites in orbit without warning to the rest of the world.[109] As far as we know, this test did not have malicious intent or the trappings of an attack; it was a calculated test with a miscalculated result.[110] The end result was thousands of pieces of potentially damaging debris in orbit, adding to an already complicated and growing debris environment.[111] Although space is a big place and there is currently room to maneuver safely, it is

[103] *Id.* at 51 ("In space offence has the advantage over defence, argues Space Force's chief, General Chance Saltzman; the side that delivers the first blow can quickly gain the upper hand.").
[104] Bowman & Thompson, *supra* note 3 (describing a Russian satellite test launching a projectile after getting within range of a U.S. satellite, and separately discussing the possibility of a Pearl Harbor in space). *See also* STOKES ET AL., *supra* note 40, at 9 (noting P.R.C. focus on developing "super agile satellites").
[105] *Gathering the Guardians*, *supra* note 9, at 52.
[106] *Gathering the Guardians*, *supra* note 9, at 52.
[107] *See*, *e.g.*, MCCALL, supra note 16, at 2 (recounting collisions and ASAT tests leaving debris).
[108] *Id.*; *see also Gathering the Guardians*, *supra* note 9, at 52 (noting concern for miscalculations potentially leading to escalation).
[109] Weeden, *supra* note 70.
[110] *See id.*
[111] *See* KELSO, *supra* note 73.

becoming more crowded with every passing year from debris and other satellites.[112]

Besides the potentially harrowing consequences for people on Earth possible with miscalculations of this magnitude (emergency communications disruptions, navigation blackouts, or financial system failures, to name a few), the consequences for further exploitation of the space domain may also be grave.[113] As the wreckage from destroyed satellites accumulates, there is less available operating space.[114] When there is less operating space, nations may have to compete for that space or modify their operations to account for orbit patterns accumulating debris and competing assets.[115] In fact, the accumulation of debris could lead to a tipping point where subsequent collisions "create more debris creating a runaway chain reaction of collisions and more debris known as the Kessler Syndrome," eventually increasing the "risk to satellites and spacecraft . . . until the orbit is no longer usable."[116]

Miscalculation may also lead to escalation, particularly if nations are not transparent with each other regarding the actions they are taking in space.[117] It does not take an overly active imagination to see the possibility of a miscalculated breakage, for example, being attributed to hostile intent and commencing a series of tit-for-tat destruction of essential capabilities.[118] Such possibilities require a closer look at the legal framework intended, in part, to prevent such catastrophes and the horrors of war revisited unnecessarily upon civilians: the Law of Armed Conflict, or LOAC.

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[112] McCall, *supra* note 16, at 2.
[113] Koplow, *supra* note 2, at 347.
[114] McCall, *supra* note 16, at 2.
[115] *Id.*

[116] Heather F. Riley, *Micrometeoroids and Orbital Debris (MMOD)*, NASA (June 14, 2016), https://www.nasa.gov/centers-and-facilities/white-sands/micrometeoroids-and-orbital-debris-mmod/.
[117] *Gathering the Guardians*, *supra* note 9, at 52.
[118] *Id.*; *see also* Krass, *supra* note 24 (noting the difficulty in determining intentions and the potential for mistaken response).

II. LAW OF ARMED CONFLICT IN SPACE – A MATTER OF PERSPCTIVE

The LOAC is a broad set of legal considerations formed by international consensus, national determination, and repeated practice.[119] It has a history dating back centuries and has consistently developed to accommodate new technologies, new legal frameworks of states (and non-state actors), and new perspectives on warfare.[120] This Article focuses on two discrete LOAC principles: distinction and proportionality.

A. *Distinction*

Distinction is the method and requirement by which a combatant determines the status of a target to refrain from striking a civilian person or object.[121] It is incumbent on a combatant to take reasonable precautions to do no or minimal harm to non-military targets in the course of an attack.[122]

The distinction analysis is different for people (i.e., whether a person is a legally targetable combatant) versus objects.[123] This Article discusses the distinction analysis for objects due to the lack of people in space, though one could see the eventual need to vigorously practice distinction of combatants as more people begin orbiting the planet.[124]

Generally, the attacker must consider whether the "nature, location, purpose or use" makes the target military in nature and whether the "destruction, capture or neutralization" of the target offers the attacker a military advantage.[125] Part III D discusses

[119] LAW OF WAR MANUAL, *supra* note 12, § 1.3.
[120] *See* LAW OF WAR MANUAL, *supra* note 12, at iv-vii.

[121] LAW OF WAR MANUAL, *supra* note 12, § 5.5; INT'L COMM. OF THE RED CROSS, *Principle of Distinction: Introductory Text*, HOW DOES LAW PROTECT IN WAR?, https://casebook.icrc.org/law/principle-distinction (last visited Nov. 16, 2024).
[122] LAW OF WAR MANUAL, *supra,* note 12, § 2.5.
[123] LAW OF WAR MANUAL, *supra* note 12, § 5.5.2.
[124] *See, e.g.*, Luckenbaugh, *supra* note 88 (quoting General Saltzman's comments about protecting astronauts).
[125] LAW OF WAR MANUAL, *supra* note 12, § 5.6.3.

examples of distinction violations on Earth and their implications for loosening global standards for distinguishing between civilian and military targets as well as the P.R.C.'s potential future conduct with regard to distinction.[126]

B. *Proportionality*

After determining a potential target is a military objective and it is advantageous to destroy or capture it, the next calculus is determining the amount of force to use such that the attack is proportional to what is necessary to complete the objective.[127] Broadly speaking, the use of force against a military target should not cause more harm to civilians and civilian objects than is necessary.[128]

Over the past few years, combat on Earth has demonstrated several successes and failures in applying the principle of proportionality. Among the most clear-cut examples of using overwhelming force without apparent consideration for civilian consequences is Russia's invasion of Ukraine, covered in more detail in Part III D.[129] Whether military necessity required that use of force will be a question evaluated according to the evidence and the commander's belief in military necessity at the time.[130]

In space, the question of proportionality (and inflicting harm on civilians) is particularly complicated. Due to the high costs of participation, nobody—including private companies unrelated to the defense enterprise (with the exception of the occasional multi-

[126] *See* discussion *infra* Part III.D.

[127] LAW OF WAR MANUAL, *supra* note 12, §§ 5.10, 5.12 ("Combatants must refrain from attacks in which the expected loss of civilian life, injury to civilians, and damage to civilian objects incidental to the attack would be excessive in relation to the concrete and direct military advantage expected to be gained.").

[128] *Id.* § 5.10-12.

[129] *See* discussion *infra* Part III.D.

[130] LAW OF WAR MANUAL, *supra* note 12, §§ 2.2.3.3, 5.3, n.69 .

billionaire)[131]—places things in space unnecessarily.[132] This means destroying almost any space asset (unless it is outdated, broken, or strictly military) will have immediate, negative consequences for civilians. Unfortunately, these mixed or "dual-use" systems[133] are also amongst the most promising military targets for adversaries in space.

C. *Complications Inherent in "Dual-Use" Systems*

For the first few decades of spaceflight (in fact, for most of its history up until the past decade), the gateway to space was shut unless the end product had a government-related purpose or use.[134] As technology improved, so too did the ease with which private industry could access space, albeit typically with aid from its sovereign and dependent on government access to its platform or programs.[135] Increased private sector space access has been a worldwide phenomenon, and the mixing of government (including military) capabilities and private enterprise on satellites is nigh universal.[136] These are called "dual-use" systems.[137] The prevalence of these systems is due, in part, to international law that imputes responsibility on nations for the space activities of those who launch from their territory.[138] Practicality and cost-savings are also considerations.[139]

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[131] *See, e.g.*, Jacki Wattles, *SpaceX Put a Tesla Sportscar into Space Five Years Ago. Where is it Now?*, CNN (Feb. 6, 2023, 11:28 AM), https://www.cnn.com/2023/02/06/world/spacex-elon-musk-tesla-roadster-five-years-scn/index.html.

[132] *See* Thomas G. Roberts, *Space Launch to Low Earth Orbit: How Much Does It Cost?*, AEROSPACE (Sep. 1, 2022), https://aerospace.csis.org/data/space-launch-to-low-earth-orbit-how-much-does-it-cost/; MCCALL, supra note 16, at 1 (noting the expense and growing commercial market for space).

[133] *See* Almudena Azcárate Ortega, United Nations Inst. for Disarmament Rsch, Open-Ended Working Group on "Reducing Space Threats Through Norms, Rules and Principles of Responsible Behaviours": Current and Future Space-to-Space Threats by States to Space Systems (Sept. 14, 2022).

[134] MCCALL, *supra* note 16, at 1.

[135] Galbreath, *supra* note 11, at 10.

[136] *See id.* at 14.

[137] *See* STOKES ET AL., *supra* note 40, at 3 (describing "dual-use" technology as promoting military and economic growth); *see also* Krass, *supra* note 24 (describing the utilization of dual-use technologies as a legal issue in space).

[138] *See* Outer Space Treaty, *supra* note 98, art. VII.

[139] Galbreath, *supra* note 11, at 14, 22-23.

Eventually, there may be purely corporate launches with mere supervision, but currently, the U.S. and P.R.C. are only increasing the proportion of space assets that are launched and/or operated on civilian-government hybrid-developed projects.[140]

Under the LOAC, dual-use objects are those used by both the armed forces and civilians, and the DoD Law of War Manual's examples include "power stations" and "communications facilities."[141] It then draws a binary distinction between dual-use objects that are military and those that are civilian.[142] The binary view that objects like power plants either constitute a military or civilian target can be extended to satellites. The natural progression would be that despite objects like GPS satellites enabling civilian and commercial navigation, timing for everything from bank machines to some municipal water systems, and countless other civilian use applications,[143] they are still classifiable as military targets because they are utilized by the military.[144] Of course, it is incumbent upon a State to weigh proportionality when considering attacking targets in space.[145] Part IV covers whether a military advantage could outweigh the substantial civilian and commercial cost of attacking a system like GPS.

D. *Deterioration of LOAC Adherence Worldwide*

[140] MCCALL, *supra* note 16, at 1; STOKES ET AL., *supra* note 40, at 59.

[141] LAW OF WAR MANUAL, *supra* note 12, § 5.6.1.2.

[142] LAW OF WAR MANUAL, *supra* note 12, § 5.6.1.2 ("[F]rom the legal perspective, such objects are either military objectives or they are not; there is no intermediate legal category. If an object is a military objective, it is not a civilian object and may be made the object of attack. However, it will be appropriate to consider in applying the principle of proportionality the harm to the civilian population that is expected to result from the attack on such a military objective.").

[143] *GPS Applications*, *supra* note 20; Beames, *supra* note 19.

[144] *See* Tara Brown, *Can Starlink Satellites be Lawfully Targeted?*, ARTICLES OF WAR (Aug. 5, 2022), https://lieber.westpoint.edu/can-starlink-satellites-be-lawfully-targeted (finding a civilian or dual-use satellite can be a legal military target if used for military purposes under customary international law).

[145] INT'L COMM. OF THE RED CROSS, *supra* note 15, at 1354-1355; *see also* LAW OF WAR MANUAL, *supra* note 12, § 5.12.

Adding to the complicated universe of varying interpretations and priorities within the LOAC, it is worth noting the recent trend of disregarding or skirting the LOAC principles.[146] There is a paucity of data for considering LOAC application in the space domain because there has not yet been armed conflict in space.[147] But the protections afforded by distinction and proportionality may be on the decline in customary international law,[148] a concerning trend considering the need for more stringent protections in space.

Russia has taken the lead in overt disregard for customary international law, treaty law, and the law of armed conflict during its invasion of Ukraine.[149] The Russian Ground Forces' targeting of civilians and use of the Ukrainian civilian population as human shields flies in the face of the principle of distinction.[150] Russia has targeted not only so-called "dual-use" facilities in Ukraine, including dams, power plants, and roads, but also purely civilian-used structures such as schools and apartment buildings.[151] Since the beginning of the war, Russia has also targeted space systems providing communications to civilians across Europe, including in Ukraine.[152] Far from condemning Russia's invasion of Ukraine (including its attack on satellite

[146] Michael N. Schmitt, *Year Ahead - International Humanitarian Law at Risk,* ARTICLES OF WAR (Jan. 11, 2024), https://lieber.westpoint.edu/international-humanitarian-law-risk/; Blaise Cathcart, *The Creeping Normality of LOAC Noncompliance,* ARTICLES OF WAR (Apr. 13, 2022), https://lieber.westpoint.edu/creeping-normality-loac-noncompliance/.
[147] Frans G. von der Dunk, *Armed Conflicts in Outer Space: Which Law Applies?*, 97 INT'L L. STUD. 188, 201 (2021).
[148] Schmitt, *supra* note 146; Cathcart, *supra* note 146.
[149] Michael N. Schmitt, *Ukraine Symposium - Weaponizing Civilians: Human Shields in Ukraine*, ARTICLES OF WAR (Apr. 11, 2022), https://lieber.westpoint.edu/weaponizing-civilians-human-shields-ukraine/.
[150] *See, e.g.*, Carlotta Gall & Andrew E. Kramer, *In a Kyiv Suburb,'They Shot Everyone They Saw,'* N.Y. TIMES (Apr. 3, 2022), https://www.nytimes.com/2022/04/03/world/europe/ukraine-russia-war-civilian-deaths.html.
[151] *See, e.g.*, HUM. RTS. WATCH ET AL., "OUR CITY WAS GONE": RUSSIA'S DEVASTATION OF MARIUPOL, UKRAINE (2024), https://www.hrw.org/sites/default/files/media_2024/02/ukraine0224web_0.pdf.
[152] Tara Brown, *Ukraine Symposium - The Risk of Commercial Actors in Outer Space Drawing States into Armed Conflict*, ARTICLES OF WAR (July 8, 2022), https://lieber.westpoint.edu/commercial-actors-outer-space-armed-conflict/.

communication systems), the P.R.C. has continued normal trade relations with Russia and has expressed, at worst, neutrality toward the war.[153] The P.R.C.'s condonation of the invasion and lack of condemnation for Russia's LOAC violations, does not inspire confidence in the P.R.C. and its allies' future adherence to the LOAC.

The P.R.C. has similarly begun to devalue and attempt to delegitimize customary international law and treaty law in pursuit of its interests around the world, albeit not in an international armed conflict.[154] P.L.A. and P.L.A.-directed naval and aerial activities in the South China Sea routinely disregard international norms.[155] By slowly but surely building up militias and influence in the area, the P.R.C. can direct efforts against foreign nationals with little recourse.[156] Using military assets and directing militias to harass civilian fishing boats, flying military planes near foreign aircraft, and occupying foreign islands and waters are all indications the P.L.A. is willing to use force or the threat of force against civilians.[157] Such behavior in the region is an attempt to curtail freedom of navigation in an otherwise international zone.[158] This pattern incorporates military-civil fusion,

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[153] *See China's Position on Russia's Invasion of Ukraine*, U.S.-CHINA ECON. AND SEC. REV. COMM'N (Oct. 31, 2024), https://www.uscc.gov/research/chinas-position-russias-invasion-ukraine ("[A]nalysts have observed Russia using railways to transport Chinese equipment in support of Russia's war in Ukraine . . . . Data provided by China's General Administration of Customs shows China-Russia trade reached $218.2 billion between January and November 2023, surpassing the total for all of 2022.").

[154] Matthew Waxman, *U.S. State Department Picks Apart PRC's South China Sea Customary Law Claim*, LAWFARE (Feb. 1, 2022, 8:01 AM), https://www.lawfaremedia.org/article/us-state-department-picks-apart-prcs-south-china-sea-customary-law-claim.

[155] Lynn Kuok, *How China's Actions in the South China Sea Undermine the Rule of Law*, *in* GLOBAL CHINA: ASSESSING CHINA'S GROWING ROLE IN THE WORLD 4-5 (BROOKINGS 2019), https://www.brookings.edu/wp-content/uploads/2019/11/FP_20191118_china_scs_law_kuok.pdf.

[156] Waxman, *supra* note 154.

[157] *See* Shuxian Luo & Jonathan G. Panter, *China's Maritime Militia and Fishing Fleets: A Primer for Operational Staffs and Tactical Leaders*, MIL. REV. Jan.-Feb. 2021, at 11-12; *see also* Natasha Bertrand, *Chinese Fighter Jet Got Within 10 Feet of US Bomber Over South China Sea, US Military Says*, CNN (Oct. 27, 2023, 6:40 AM), https://www.cnn.com/2023/10/26/politics/china-fighter-jet-us-bomber-south-china-sea/index.html.

[158] Waxman, *supra* note 154.

using mixed assets to accomplish military objectives, and may prelude similar tactics to limit freedom of navigation or freedom of orbit placement in space.[159]

III. GAPS IN THE CURRENT FRAMEWORK

The current protections against widespread destruction incident to conflict in space include treaties and customary international law (LOAC). The former is dated, with few signs of breaking diplomatic gridlock; the latter is insufficient to protect against the consequences of conflict in space.

A. *Current Treaty Law*

Current prevention measures for armed conflict in space, including protection of civilian capabilities, are not enough to prevent escalation to a catastrophic loss of space capabilities. The foundational treaty is the Outer Space Treaty, which took effect in 1967 and was engineered largely by representatives from the U.S. and the Soviet Union.[160] Other current spacefaring nations, notably the P.R.C., were not yet persistently active in outer space.[161] The Outer Space Treaty attributes liability to the "State Party to the Treaty that launches or procures the launching of an object into outer space. . . ," should the

[159] *See* Clark, *supra* note 15 (General Saltzman has stated, "[T]here are going to be commercial entities, commercial organizations, commercial capabilities and assets that get caught up in the conflicts . . . . Space is no different than sea lanes . . . . The US has a long history of saying we're going to protect the things that we need to be successful. So it would stand to reason that that same philosophy would extend into space, and I have no reason to believe that that will be different.").

[160] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, UNITED NATIONS OFF. FOR OUTER SPACE AFFS., https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/travaux-preparatoires/outerspacetreaty.html (last visited Nov. 17, 2024) (listing various negotiation records for the Outer Space Treaty with a substantial number of those being filed by the United States, the Soviet Union, and the United Kingdom).

[161] *Timeline: Major Milestones in Chinese Space Exploration*, REUTERS (Dec. 2, 2020, 7:28 AM), https://www.reuters.com/article/us-space-exploration-china-moon-timeline-idINKBN28B5GE/.

object cause damages.[162] It also details several methods of communication of activities in space, including a registry of space objects and notification requirements to the U.N. Secretary-General and the public as to the "nature, conduct, locations and results" of space activities.[163] The only weaponry restrictions are (1) prohibitions of "nuclear weapons or any other kinds of weapons of mass destruction" on celestial bodies or in Earth's orbit and (2) prohibitions of weapons and weapons testing on the moon or "other celestial bodies."[164] Notably absent are provisions regulating conventional or non-mass-destructive weapons in orbit and the use of space assets to support military activity on Earth.[165] Also missing are any provisions for the resolution of violent conflict in space beyond the liability provision.[166]

In addition to the Outer Space Treaty, the U.N. General Assembly adopted three subsequent agreements: the Rescue Agreement (1968), the Liability Convention (1972), and the Registration Convention (1976).[167] The Liability Convention is the most relevant for the purposes of this Article because it expands on the Outer Space Treaty's provision imposing liability on States responsible for international damage in space.[168] The Liability Convention assigns absolute liability to States for damage to aircraft or objects on Earth and assigns liability for damage for which a state is at fault in space.[169] Although at the time of signing the Liability Convention enjoyed broad support, it does not address placement of arms in space or damage from military operations specifically, and there has not been

[162] Outer Space Treaty, *supra* note 98, art. VII.
[163] *Id.* art. VIII, XI.
[164] *Id.* art. IV.

[165] *See generally id.*
[166] *See generally id.*
[167] Dean Cheng, *China and Space: The Next Frontier of Lawfare*, U.S. INST. OF PEACE (Aug. 2, 2023), https://www.usip.org/publications/2023/08/china-and-space-next-frontier-lawfare; Koplow, *supra* note 2, at 349.
[168] *See* Outer Space Treaty, *supra* note 98, art. VII; G.A. Res. 2777 (XXVI) Convention on International Liability for Damage Caused by Space Objects (Nov. 29, 1971).
[169] G.A. Res. 2777 (XXVI), *supra* note 167, art. II, III.

any resolution to close that gap.[170] Further, there is no indication that the P.R.C. would account for the Liability Convention in its military operations in space because it would likely either ignore or bear the cost of replacement of enemy satellites destroyed during armed conflict.[171]

Russia and the P.R.C.'s proposed solution, the Treaty on the Prevention of the Placement of Weapons in Outer Space, and the Threat or Use of Force against Outer Space Objects ("PPWT"), also does not adequately protect against escalation and the tightrope of distinction in outer space.[172] The U.S. has opposed the proposed treaty because it allows broad exceptions for weaponry in space and does not address the recent P.R.C. development and placement of weapons in contradiction to the proposal's terms.[173] Nor does the PPWT include verification measures to ensure countries abide its restrictions.[174] Verification would be on a voluntary basis by member States, with no salient enforcement mechanisms.[175] In addition, the proposal has glaring loopholes that could allow for "stockpiling" or

[170] Koplow, *supra* note 2, at 349.
[171] Trevor Kehrer, Comment, *Closing the Liability Loophole: The Liability Convention and the Future of Conflict in Space*, 20.1 CHI. J. INT'L L. 178, 195 (2019) (the incentives for states to ignore the Liability Convention (e.g., surprise attack, early advantage) may outweigh the cost of complying with the Liability Convention, if they ever comply at all).
[172] Koplow, *supra* note 2, at 351-52; *see also* Brian Britt, *The PPWT and Ongoing Challenges to Arms Control in Space*, NAT'L DEF. UNIV. PRESS (July 19, 2024) https://ndupress.ndu.edu/Media/News/News-Article-View/Article/3841072/the-ppwt-and-ongoing-challenges-to-arms-control-in-space/#:~:text=In%20the%2015%20years%20since,notable%20lack%20of%20proposed%20alternatives.
[173] *See* Bradley Bowman & Jared Thompson, *Russia and China Seek to Tie America's Hands in Space*, FOREIGN POL'Y (Mar. 31, 2021, 11:31 AM), https://foreignpolicy.com/2021/03/31/russia-china-space-war-treaty-demilitarization-satellites/; *see also* Michael Aho, Advisor, U.S. Delegation to the Conf. on Disarmament, United States Remarks for Conference on Disarmament Subsidiary Body 3 – Prevention of An Arms Race in Outer Space (Mar. 22, 2022).
[174] *See* Jeff Foust, *U.S. Dismisses Space Weapons Treaty Proposal as "Fundamentally Flawed*," SPACE NEWS (Sep. 11, 2014), https://spacenews.com/41842us-dismisses-space-weapons-treaty-proposal-as-fundamentally-flawed/; *see also* Aho, *supra* note 173.
[175] *See* Koplow, *supra* note 2, at 352; *see* Bowman & Thompson, *supra* note 173.

build-up of ASAT capability in preparation for immediate deployment in the event of withdrawal from the would-be treaty.[176] This means the P.R.C. could continue to test and use weapons under the auspices of an international resolution, potentially helping to shape a new customary international law regime around the use of weaponry in space while technically complying with the terms of the proposed treaty.[177]

Current treaty law and proposed diplomatic solutions are unlikely to yield satisfactory results to protect the space apparatuses that augment and facilitate modern life.[178] U.S. diplomacy as a preventative measure has stalled, with no specific proposals to limit weapons in space.[179] The U.N. Conference on Disarmament has been working on the "prevention of an arms race in outer space" since 1981, producing a set of recommendations in 1994.[180] But in the years between 1995 and 2018, the Conference has neither agreed on an agenda for ASAT weapon regulation nor "initiate[d] any serious negotiations."[181] Other U.N. bodies, though productive in terms of commercial space, have not made meaningful strides in arms control.[182] Based on the lack of progress so far and the continued skepticism between States as to intentions for military purposes in space,[183] the model way ahead for protecting space capabilities is likely not through treaty law or international arms control laws.[184]

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[176] *See* Aho, *supra* note 173; *see also* Foust, *supra* note 174; Koplow, *supra* note 2, at 352 (noting, however, "[the PPWT] does include some voluntary transparency- and confidence-building measures," citing to the voluntary, unenforceable measures of Article V).

[177] *See* Bowman & Thompson, *supra* note 173; *see also* Cheng, *supra* note 167; Aho, *supra* note 173.

[178] *See* Koplow, *supra* note 2, at 354.

[179] *See id*; *see also* Aho, *supra* note 173 (noting continued intent for discussions as of 2022).

[180] Aho, *supra* note 173.

[181] *See* Koplow, *supra* note 2, at 350.

[182] *See id.* at 351.

[183] *See, e.g.*, Bowman & Thompson, *supra* note 173.

[184] However, this is not to say the U.S. should abandon its endeavors at the U.N. or the Conference on Disarmament. Maintaining a seat at the table and voicing opposition to foreign military exploitation of space can help shape customary

B. *Current LOAC and Customary International Law*

The two greatest challenges to applying the LOAC in space are (1) the obstacles to distinction inherent to the domain and pervasive dual-use systems and (2) the necessarily lopsided proportionality analysis that would inevitably arise in future conflicts.[185] This section elaborates on the LOAC's distinction and proportionality shortcomings in space, comments on nascent customary international law, and concludes with an example in GPS.

1. Distinction

The LOAC principle of distinction—the calculus by which an attacker is obligated to distinguish military from civilian targets[186]—is frustrated in space in part because of the difficulties inherent in identifying, tracking, and attributing actions to objects without line-of-sight miles above the Earth.[187] Militaries and corporations operate and monitor satellites without being able to see them, and the seemingly simple act of seeing what happened to a space asset can be complicated by not having an accurate sight picture of the object or its surroundings.[188] Space is a massive domain that presents challenges in tracking and identifying the increasing number of objects in orbit.[189] After an object is identified and tracked, the potential problems do not end. What may have been initially identified as a test craft or civilian-use satellite may then use a hidden capability to attack, a possibility one Russian satellite demonstrated in 2019.[190]

In addition to the difficulties inherent in operating in the domain, distinction is complicated by the dual-use technologies so

international law and may yield some benefits to protecting capabilities in space. *See Customary International Law*, CORNELL L. SCH. LEGAL INFO. INST., https://www.law.cornell.edu/wex/customary_international_law (last visited Nov. 16, 2024); Krass, *supra* note 24; Aho, *supra* note 173; *see also* Cheng, *supra* note 167.

[185] *See* Brown, *supra* note 144.

[186] LAW OF WAR MANUAL, *supra* note 12, § 2.5.1.

[187] *See, e.g.*, *Gathering the Guardians*, *supra* note 9, at 52; Bowman & Thompson, *supra* note 3.

[188] Cooper, *supra* note 90; Luckenbaugh, *supra* note 88.

[189] Luckenbaugh, *supra* note 88.

[190] Bowman & Thompson, *supra* note 3.

prevalent in space.[191] As previously noted, an object is either civilian or military under a traditional DoD calculus.[192] A military object is "any object which by its nature, location, purpose or use makes 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."[193] Following this formula, there is little doubt that a dual-use system, by its very nature, is a valid military target.[194] Considering the dual-use nature of the domain, systems in space may be considered valid military targets, depending on the use at the time.[195] Thus, distinction alone, as currently conceptualized, cannot reliably prevent catastrophic consequences to civilians[196] or protect against indiscriminate destruction without the benefit of space support.[197]

2. Proportionality

After determining a dual-use system is a valid military target, a proportionality analysis is required to assess a strike's legality. [198] Proportionality—the methodology by which an attacker is obligated to minimize unnecessary civilian harm where feasible[199]—is a murky

[191] *See* Ortega, *supra* note 19 (explaining the prevalence of dual-use technologies in space, but making a distinction between "dual-use" and "dual-purpose" objects; this is a valuable discussion, but for the purposes of this article, a distinction without a difference.).
[192] LAW OF WAR MANUAL, *supra* note 12, § 5.6.1.2.
[193] LAW OF WAR MANUAL, *supra* note 12, § 5.6.3.
[194] *See* Brown, *supra* note 144.
[195] *See id.*; Galbreath, *supra* note 11, at 10-11 (explaining the shared domain of space is difficult to parse for military vice civilian targets); *see* INT'L COMM. OF THE RED CROSS, *supra* note 15, at 1352-53.
[196] INT'L COMM. OF THE RED CROSS, *supra* note 15, at 1352-53.
[197] *See US Military Imagines War Without GPS*, PHYS.ORG (Dec. 19, 2017), https://phys.org/news/2017-12-military-war-gps.html; Robert Hoffman, *Lost on the Next Battlefield: The Need to Replace GPS*, WAR ROOM (Jan. 21, 2022), https://warroom.armywarcollege.edu/articles/lost/ (Without the ability for militaries to use capabilities in space, States will be fighting in the dark, thereby increasing the odds of catastrophic miscalculation.).
[198] LAW OF WAR MANUAL, *supra* note 12, §§ 2.4.1.1, 5.10.1.
[199] LAW OF WAR MANUAL, *supra* note 12, § 5.10.

and nearly impossible calculus in space that is made more difficult by the abbreviated timelines by which orbital events can occur.[200]

When considering the incidental civilian harm to an attack in space, the immediate consequences, or "first-order" effects, are tied to the destruction of the asset in question.[201] Destroying a dual-use system—or unwittingly destroying a civilian system mistaken for a military one—could have far-reaching effects on the ground, including economic havoc and interrupting the facets of daily life much of the world (including the U.S.) relies on.[202]

An additional reasonably foreseeable consequence of destroying a satellite, or "second-order" effect beyond the satellite's initial loss of capability, is the creation of space debris.[203] This debris can stay in orbit for decades.[204] The space domain is already becoming congested with debris from the past six decades of spaceflight during which nations and corporations' operations have intentionally or unintentionally destroyed objects.[205] The debris from a kinetic attack, therefore, could have catastrophic consequences for other satellites, including those operated by neutral States, resulting in cascading effects as the services those systems provide are degraded or

[200] Bowman & Thompson, *supra* note 3.
[201] INT'L COMM. OF THE RED CROSS, *supra* note 15, at 1352-53; Koplow, *supra* note 2, at 337-38 (noting the effects of satellite destruction and a "'day without space' would be a very bad day, indeed . . . .").
[202] INT'L COMM. OF THE RED CROSS, *supra* note 15, at 1352-53; Koplow, *supra* note 2, at 337-38; Galbreath, *supra* note 11, at 10.
[203] *See, e.g.*, Koplow, *supra* note 2, at 340-41 (explaining the aftermath of one particular ASAT test); PRC MILITARY DEVELOPMENTS REPORT, *supra* note 6, at 103 (noting the results of that same ASAT test).
[204] INT'L COMM. OF THE RED CROSS, *supra* note 15, at 1353.
[205] MCCALL, supra note 16, at 2 ("[O]ver 60 years of space activities—along with some explosive events in space including the 2007 Chinese (ASAT) test, the 2009 Iridium-Cosmos satellite collision, and India's ASAT test in 2019—have left large quantities of uncontrolled debris in these orbital 'lanes.' This includes tens of thousands of trackable items (softball size or bigger) and many millions (170 million according to NASA) of smaller objects, any of which may disable or destroy a satellite. Orbital collision prediction and avoidance capability is limited, but improving.").

eliminated.[206] Beyond the immediate second-order effects, accumulated debris poses a compounding threat, present long after the attack.[207] The repercussions on civilian life of a kinetic attack in space, including the likely ensuing escalation, could be far-reaching and endure for decades.[208]

The counterargument to the above analysis may be that the commander with strike authority would conduct the proportionality analysis, see the potential for disastrous consequences, and determine not to strike.[209] But this argument does not account for circumstances in which the U.S. is forced into a position to attack or destroy enemy space assets to avoid existential threats. This argument also likely assumes the P.R.C. would follow the same LOAC calculus, which is an assumption the next section vitiates.

3. Current Customary International Law

The customary international law of war in space continues to develop as more global players deploy more capabilities.[210] Application of the LOAC as customary international law in space is,

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[206] Carns, *supra* note 39, at 178 (noting small particles are "tantamount to bullets in space and can cause catastrophic damage to even the largest of space objects without any warning."); INT'L COMM. OF THE RED CROSS, *supra* note 15, at 1353; Int'l Comm. of the Red Cross, *Constraints under International Law on Military Operations in, or in Relation to, Outer Space during Armed Conflicts* 5 (May 3, 2022) (unpublished paper).

[207] Luckenbaugh, *supra* note 88.

[208] Krass, *supra* note 24 ("Proliferation of debris, especially in protected environments such as low Earth orbit, increases operating risks and complicates insurance markets for commercial space providers."); INT'L COMM. OF THE RED CROSS, *supra* note 15, at 1353; Carns, *supra* note 39, at 175-79.

[209] *See* LAW OF WAR MANUAL, *supra* note 12, § 2.4.1.2 (noting the principle of proportionality "creates obligations to refrain from attacks in which the expected harm incidental to such attacks would be excessive in relation to the concrete and direct military advantage anticipated to be gained and to take feasible precautions in planning and conducting attacks to reduce the risk of harm to civilians and other persons and objects protected from being made the object of attack." Thus, the military advantage that could outweigh the disastrous, global consequences of an attack and subsequent escalation would likely have to be existential in nature.).

[210] Krass, *supra* note 24 ("Novel space activities present not just technical issues, but also difficult legal questions."); PECUJLIC, *supra* note 11, at 22-23.

as yet, untested.[211] Further, the international bodies that intended to codify understandings for conduct in space have failed to agree on new rules for armed conflict in space, signifying a lack of consensus in customary international law.[212] The P.R.C. is prepared to influence (and perhaps take the lead in) the creation of new international norms, crafting its own "lawfare" against U.S. space interests.[213] The P.R.C.'s treatment of customary international law in the South China Sea, as discussed above in Section III.D., it may be expected the P.R.C. will violate current rules and norms to shape a new customary international law regime.[214]

4. Case Study: The Global Positioning System (GPS) and its Counterparts

Consider GPS. Although there have been discussions about replacing it and finding other solutions for navigation, it remains critical to military operations.[215] For this example, Beidou, the Chinese competitor to GPS, can be used interchangeably to illustrate the nature of these systems and their effects on the civilian population.[216]

Per customary international law and the LOAC, GPS could be considered a valid military target if it is utilized for military purposes.[217] But it is used for military and civilian purposes. Not only does it support combat operations; it is also fundamental to the global

[211] Von der Dunk, *supra* note 146, at 201.
[212] Koplow, *supra* note 2, at 349-51.
[213] Cheng, *supra* note 167 (The P.R.C. is "one of the most thoughtful practitioners of legal warfare or "lawfare . . . . For the PRC, this is a rare moment where it can play a role in establishing the very foundations of the legal infrastructure that will govern what they see as a key strategic venue."); *see also* Waxman, *supra* note 154.
[214] *See supra* Part III.D.
[215] Hoffman, *supra* note 196.
[216] *See China's Beidou Navigation System to Serve $156 Bln Home Markets by 2025*, REUTERS (May 26, 2021, 1:38 AM), https://www.reuters.com/world/china/chinas-beidou-navigation-system-serve-156-bln-home-market-by-2025-2021-05-26/ ("Related Beidou products have been exported to about 120 countries, serving more than 100 million users worldwide," per state media.).
[217] *See* Brown, *supra* note 144 (explaining Starlink can be targeted as a military objective).

economy and modern life.[218] Still, it is targetable as a military-use asset under the current distinction test.[219]

But what of proportionality? Again, proportionality "weighs the justification for acting against the expected [civilian] harms to determine whether the latter are disproportionate in comparison to the former."[220] Assuming, *arguendo,* the deciding authority determined the military advantage outweighed the civilian cost, as the P.R.C. might do, the LOAC regime does not prohibit the strike.[221] Article 2(4) of the U.N. Charter would prohibit an unprovoked attack, but a belligerent could conceivably justify an attack in space as self-defense or otherwise.[222] The Outer Space Treaty and Liability Convention could impose liability for the at-fault state, but the limitations of those instruments have already been noted.[223]

The consequences of an attack on GPS, Beidou, or other similar systems that provide critical services globally would be severe, particularly if the attack resulted in escalation and further destruction.[224] Society would lose the system's functionality and risk losing use of the entire domain due to compounding second-order effects.[225] Even this simple example demonstrates how a State could cause nigh-incalculable damage to large swathes of the population and

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[218] Beames, *supra* note 19.
[219] *See* Brown, *supra* note 144; LAW OF WAR MANUAL, *supra* note 12, §§ 5.6.1.2, 5.6.3.
[220] LAW OF WAR MANUAL, *supra* note 12, § 2.4.1.2.
[221] *Gathering the Guardians*, *supra* note 9 ("In space offence has the advantage over defence, argues Space Force's chief, General Chance Saltzman; the side that delivers the first blow can quickly gain the upper hand."); Cooper, *supra* note 90 (noting the lack of defenses for U.S. satellites in contrast to the substantial advantages for the enemy if they are destroyed).
[222] U.N. Charter art. 2, ¶ 4, 51.
[223] *See* Kehrer, *supra* note 171, and accompanying text.
[224] *See* Galbreath, *supra* note 11, at 16-18 (describing U.S. and P.R.C. counterspace capabilities and vulnerabilities, including the need for the Space Force to have the "ability to hold [P.R.C.] assets at risk," in a possible retaliation).
[225] *See* Beames, *supra* note 19 ("[T]he rest of the world is just as dependent on GPS to enable basic mobility and underpins every other sector of the modern global economy."); Galbreath, *supra* note 11, at 10; Riley, *supra* note 116 (describing the Kessler Syndrome and the loss of orbital paths).

inhibit access to the space domain, all while complying with the current LOAC.[226]

IV. MAKE IT SO[227] – RECOMMENDATIONS FOR A NEW FRAMEWORK

The current path of customary international law and rising tensions between spacefaring nations, particularly the P.R.C. and the U.S., is leading to a landscape far divorced from the Outer Space Treaty's blue-sky goals of preserving space for peaceful purposes.[228] However, there is capacity for systems in space to support security operations and warfighting without catastrophic clashes resulting in inordinate civilian harm around the globe and endangering the use of outer space. This Article does not recommend curtailing the U.S.' ability to act in self-defense.

One possible solution—and one the current rate of military development of space seems to be building towards—is to echo the Cold War's framework of "mutually assured destruction."[229] This framework would entail an understanding that as fast as operations in space can be[230] and as important as space infrastructure has become,[231] an attack in space would be presumed to be an opening salvo to a broader conflict. The primary spacefaring nations would exhaust all options to "win," likely resulting in catastrophic damage to the entire

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[226] *See* Alan O'Connor, *GPS: A $1.4 Trillion Economic Engine*, RTI INT'L (Sept. 11, 2019) https://www.rti.org/impact/gps-14-trillion-economic-engine.

[227] STAR TREK: THE NEXT GENERATION: ENCOUNTER AT FARPOINT (Paramount Domestic Television Sept. 28, 1987).

[228] Koplow, *supra* note 2, at 347-48;INT'L COMM. OF THE RED CROSS, *supra* note 15, at 1354-55.

[229] *See* Bowman & Thompson, *supra* note 173 (noting the arms buildup by the P.R.C. and Russia, to include weapons designed to counter American assets in space); Tom de Castella, *How Did We Forget About Mutually Assured Destruction?*, BBC NEWS (Feb. 15, 2012), https://www.bbc.com/news/magazine-17026538.

[230] *See* Cooper, *supra* note 90 (noting a missile can reach the lowest satellites "within five to 15 minutes"); Bowman & Thompson, *supra* note 3 (describing a Russian satellite "next to a U.S. satellite" and releasing a "high-speed projectile" without warning).

[231] *See, e.g.*, Koplow, *supra* note 2, at 334; Beames, *supra* note 19.

domain, the global economy, and the livelihoods of millions.[232] After all, the current LOAC could mean nearly every dual-use asset in space is a legal military target with a losing proportionality analysis: if "we" do not strike back, "they" will capture space dominance, and "we" lose the advantage in space and on the ground.[233] Mutually assured destruction works until it catastrophically fails, which could be the result of any number of random happenings (such as a miscommunication or misattribution in space) or itchy trigger fingers.[234]

An alternative to this path lies in a more restrictive LOAC, either through customary international law or, less probably, revising international treaty law specifically for operations in outer space.[235] Spacefaring nations may consider skipping the unpleasantness of the mutually assured destruction phase—to continue the Cold War analogy—in favor of directly negotiating the "détente" phase of the nuclear century.[236] Professor Koplow suggests modeling a mutual inspection regime, perhaps complementing shared awareness of space capabilities and assets to avert the space arms race that could potentially be a miscalculation away from catastrophe.[237] Another of his proposals is a "no first use" policy of certain weapons, with the aim of forming a "taboo" around their use in customary international law States would hesitate to violate.[238] The U.S. has already started modeling norms in this manner, announcing a unilateral "commitment not to conduct destructive direct-ascent [ASAT] missile testing."[239] This is one step towards new protective customary international law that avoids curtailing the U.S. advantage in space. Even with strong U.S. leadership in forming new international norms,

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[232] *See* LAW OF WAR MANUAL, s*upra* note 12.
[233] *See supra* Part IV.B.2.
[234] *See* de Castella, *supra* note 228; s*ee also* John J. Mearsheimer, *Why We Will Soon Miss the Cold War*, ATLANTIC (Aug. 1990), https://www.theatlantic.com/past/docs/politics/foreign/mearsh.htm (positing the world was more stable under a regime of "mutual assured destruction").
[235] *See supra* Part IV.A.
[236] *Détente,* BRITANNICA (Nov. 7, 2024), https://www.britannica.com/topic/detente.
[237] *See* Koplow, *supra* note 2, at 373-79 (discussing enhanced space situational awareness sharing).
[238] *See* Koplow, *supra* note 2, at 355-63.
[239] Krass, *supra* note 24.

there must be widespread adoption where the consequences of violation are enforced by multinational partnerships.[240]

CONCLUSION

The current regime for the LOAC in space, customary sources of international law, and treaty law are not adequate to protect U.S. national interests or prevent the destruction of some of humanity's most critical civilian and commercial capabilities. Dual-use space systems frustrate the LOAC application of distinction and proportionality, resulting in uncertainty and legal insufficiency that could lead to national and global disaster. The cost of orbital warfare, both for immediate civilian and defense concerns and for further use of the domain, is too significant to accept the *status quo*. This Article's proposed changes to the LOAC and international customary law, as well as the proposed policy considerations, would fill the void created by the current insufficient legal framework. By acting now to build legal protections in space, the U.S. can maintain national security, work to avoid potential disaster, and continue as the global leader in the space domain.

[240] PECUJLIC, *supra* note 11, at 67-68 (noting the importance of multinational cooperation and use of allies for enforcement of "binding norms"); *see* Koplow, *supra* note 3, at 387 (When advocating for international arms control to prevent a new arms race in space, Koplow states, as this paper echoes, "This Article emphatically does not advocate simple unilateral self-restraint by the United States . . . . Instead, the call is for aggressive diplomacy, seizing the occasion to exercise international leadership in attempting to forge a more satisfactory and complete space law regime . . . . Now is the time to entrench the self-discipline, establishing effective, durable international discipline.").