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WAR BEYOND BORDERS: EXAMINING THE EXTENSION OF LAWS OF ARMED CONFLICT TO OUTER SPACE

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ABSTRACT

The rapid militarization of outer space has transformed it from a domain of scientific exploration into a potential theatre of armed conflict in the future, raising urgent questions about the applicability of the Laws of Armed Conflict (LOAC) beyond Earth. The paper analysis whether and how existing international humanitarian law frameworks can be extended to regulate hostilities in the space domain. The paper first explores the jurisdictional complexities of space activities, focusing on state responsibility, territorial analogies, and the challenges posed by the non-sovereign nature of outer space under the Outer Space Treaty, 1967. It examines how jurisdiction may be asserted over space objects, personnel, and conduct through principles of nationality, registration, control, and effective jurisdiction.

The study then addresses the threshold question of whether armed conflict can legally be recognized in outer space, assessing the applicability of international and non-international armed conflict classifications to space-based hostilities. It evaluates scenarios such as anti-satellite weapon tests, cyber operations targeting space infrastructure, and kinetic engagements between space assets to determine when the intensity and organization criteria of classifying something as “armed conflict” may be satisfied. The paper argues that hostile acts in space, though technologically distinct, can meet the legal standards of armed conflict when they result in significant military advantage, destruction, or disruption of essential civilian and military systems.

Finally, the paper analyses the scope and limits of military powers in outer space under Laws of armed conflict (LOAC) principles of distinction, proportionality, military necessity, and precaution. It evaluates whether space objects can be considered military objectives, the status of dual-use satellites, and the obligations of belligerents to protect civilian space infrastructure

¹ AUTHOR

and the limits to authorizable military movements in space. The paper acknowledges that while existing LOAC principles are conceptually capable of extending to outer space, significant normative and operational gaps remain, necessitating clearer international consensus to prevent space from becoming an unregulated battlefield and looks into possible recommendations to bridge these gaps and loopholes.

I. INTRODUCTION: THE NEW HIGH GROUND

Space has long been considered the "Province of all Mankind," a haven for scientific inquiry, communication, and exploration. However, the 21st century has brought about the "Second Space Age,"² which is marked by the democratization of orbit and its inevitable militarization for the defense of national property and, in many cases, national privacy. Space is no longer a legal vacuum as countries construct co-orbital "inspector" satellites³ and anti-satellite (ASAT) capabilities.

The central legal tension lies in the friction between the Outer Space Treaty (OST) of 1967⁴, which mandates the peaceful use of space, and the grim reality of modern warfare. This paper examines the extension of the Laws of Armed Conflict (LOAC⁵), also known as International Humanitarian Law (IHL) to this unique domain, arguing that while the law applies, its interpretation must be radically adapted.

The space has now become an accessible area which is within reach of private players that have started looking into long term markets in space tourism and space explorations. This raises broad concerns about jurisdictions and enforcement mechanisms particularly in the protection of sovereign aspect of nations, which are primarily caused due to existing interpretations and treaties. The space has shifted from "Space for Peace" to space being a "Congested, Contested, and Competitive" environment for both public and private sector bodies.

The main issue is that, in comparison to the rapid technological advancements of the world's

² Todd Harrison, Nahmyo Thomas "Strategic Studies Quarterly, Vol. 10, No. 4 (WINTER 2016)", pp. 2-13 (12 pages)

³ Prince, E.R. and Cobb, R.G., 2018. Optimal inspector satellite guidance to quasi-hover via relative teardrop trajectories. *Acta Astronautica*, 153, pp.201-212.

⁴ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 610 U.N.T.S. 205.

⁵ Solis, G.D., 2021. *The law of armed conflict: international humanitarian law in war*. Cambridge University Press.

economy, the legal "grey zone" where rapid technology improvement (ASATs, cyber-interference) beyond the 1967 Outer Space Treaty (OST) remains far behind.

II. THE JURISDICTIONAL LABYRINTH: SOVEREIGNTY VS. CONTROL

Article II⁶ of the OST is a non-appropriation doctrine which is the bedrock of space law: "*Outer space... is not subject to national appropriation by claim of sovereignty.*" This creates a unique legal environment. Unlike terrestrial war, where armies fight to seize or protect territory, space combat involves assets that are constantly in motion across "international" territory by essence of understanding the international borders as on land masses on earth.

State Responsibility on Registration:

Under Articles VI⁷ and VIII⁸ of the OST, jurisdiction is tied to the Registry. A state retains jurisdiction and control over any object it launches into space.

Any asset in space, including spacecraft, has the "nationality" of the state in which it is registered. But as "New Space" (SpaceX, Maxar) grows in popularity, the distinction between public and private action becomes hazier. LOAC dictates that states bear "international responsibility" for national activities in space, whether carried out by governmental agencies or non-governmental entities.⁹ The primary concern with private players being involved is the liability and jurisdiction when private companies (like SpaceX or Maxar) provide military-grade data during a conflict. This is an ongoing conflict especially with the use of Dual use satellites¹⁰ that serve as both military and civilian assets.

A critical gap still exists when a space asset like a satellite is decommissioned or becomes debris. If a state loses "effective control" but retains "registration," who is responsible if that asset is used as a kinetic weapon or a shield in a conflict?

⁶ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 610 U.N.T.S. 205. ART II

⁷ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 610 U.N.T.S. 205. ART VI

⁸ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 610 U.N.T.S. 205. ART VIII

⁹ SUPRA 5

¹⁰ Pražák, J., 2021. Dual-use conundrum: Towards the weaponization of outer space?. *Acta Astronautica*, 187, pp.397-405.

III. THE THRESHOLD OF CONFLICT: WHEN DOES SPACE ACTIVITY BECOME "WAR"?

Article III¹¹ of the OST explicitly states that space activities must be carried out "in accordance with international law, including the Charter of the United Nations¹²." This confirms that Article 2(4)¹³ (prohibition of the use of force) and Article 51¹⁴ (right to self-defence) apply to space. This makes the question of "what is an armed conflict?" more important to be answered and properly classified as invoking the United Nations articles is a tedious process and is not a reversible step.

In terrestrial law, the term "armed attack" has historically been linked to the use of conventional military force that causes bodily harm and fatalities. The International Court of Justice, in cases such as *Nicaragua v. United States*¹⁵, has emphasized the "scale and effects test" of an operation as key criteria for it to qualify as an armed attack.

The "scale and effects" test is a standard in international law used to determine if a hostile act is severe enough to be considered an "armed attack." This distinction is crucial because only an "armed attack" justifies a state responding with military force in self-defence.¹⁶ In simple terms, the test means that the consequences of an action are more important than the weapon used.

For Applying this "effects-based" approach to space warfare, a consensus is possible that an operation equivalent in its consequences to a conventional armed attack would indeed meet the threshold.

IV. APPLICATION OF CORE LOAC PRINCIPLES TO SPACE WARFARE

The application of laws to space is still an area of jurisprudence that lacks consensus and widely accepted works that could lay the foundation for a consensus on humanitarian law principles

¹¹ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 610 U.N.T.S. 205. ART III

¹² United Nations. (1945). *Charter of the United Nations*. <https://treaties.un.org/doc/publication/ctc/uncharter.pdf>

¹³ ART 2(4) United Nations. (1945). *Charter of the United Nations*. United Nations Office to the African Union. https://unoau.unmissions.org/sites/default/files/2025-04/united_nations_charter_0.pdf

¹⁴ ART 51 United Nations. (1945). *Charter of the United Nations*. United Nations Office to the African Union. https://unoau.unmissions.org/sites/default/files/2025-04/united_nations_charter_0.pdf

¹⁵ *Nicar. v. U.S.*, Judgment, 1986 I.C.J. Rep. 14 (June 27).

¹⁶ *Ibid*

and applications. Nonetheless, the Woomera document has become somewhat more well-known and has been used as an extensively studied academic record that is consulted when learning about space law.

The Woomera Manual: Bridging the Legal Gap in Orbit

The evolution of military technology has historically outpaced the development of governing legal frameworks. Just as the Tallinn Manual ¹⁷ provided a non-binding but authoritative restatement of international law for the cyber domain, the Woomera Manual ¹⁸ on the International Law of Military Space Operations (2023) represents a critical multi-institutional effort to codify the "rules of engagement" for the final frontier. Developed through a collaboration between the Universities of Adelaide, Exeter, Nebraska, and UNSW Canberra, the Manual bridges the gap between the idealistic "peaceful purposes" language of the 1967 Outer Space Treaty (OST) and the contemporary reality of space as a contested operational domain. The Manual is structured around 48 black-letter rules that cover three distinct phases: Peacetime, Tension/Crisis, and Armed Conflict.

Here are its most significant and debated claims:

1. The Transposition of Lex Specialis: LOAC in the Exo-Atmospheric Domain

The Manual's foundational thesis rests on the applicability of International Humanitarian Law (IHL), or the Law of Armed Conflict (LOAC), to outer space. This assertion addresses a long-standing diplomatic tension: while many nations advocate for the "Prevention of an Arms Race in Outer Space" (PAROS), the Manual adopts a pragmatic, *lex lata* approach. It posits that the absence of a specific ban on conventional weapons in space does not imply a legal vacuum. Consequently, if hostilities commence, the core pillars of IHL that are distinction, proportionality, and military necessity are immediately binding.

2. Redefining the Threshold: The "Loss of Function" Doctrine

In the "grey zone" of modern conflict, physical kinetic destruction is often superseded by electronic and cyber interference. The Woomera Manual breaks significant ground by exploring the threshold of "armed attack" under Article 51 of the UN Charter.

¹⁷ Schmitt, M. N. (Ed.). (2017). *Tallinn Manual 2.0 on the international law applicable to cyber operations*. Cambridge University Press.

¹⁸ Stephens, D., Schmitt, M. N., & McLaughlin, R. (Eds.). (2018). *The Woomera Manual on the international law of military space operations*. The University of Adelaide.

The Manual suggests that a "use of force" need not be kinetic. A cyber-attack or high-power jamming maneuver that results in a permanent loss of function for a critical satellite, rendering it a "dead" object in orbit may be legally equivalent to its physical destruction. This expansion is vital for modern deterrence, as it allows states to claim a right to self-defence against non-kinetic aggression that nonetheless causes "scale and effects" comparable to a physical strike.

3. The Debris Constraint: Reimagining Proportionality

One of the most innovative contributions of the Manual is the integration of environmental science into legal proportionality assessments. On Earth, collateral damage is often localized; in the orbital environment, the Kessler Syndrome^{19a} cascading effect of collisions means that a single strike can have indiscriminate, global consequences.

The Manual asserts that commanders must include the long-term generation of orbital debris in their proportionality calculus. If a kinetic strike on an enemy satellite creates a debris cloud that endangers neutral civilian assets or renders an orbital plane unusable for generations, such an attack may be deemed "indiscriminate" and thus a violation of international law.

4. Attribution and the Commercial-Military Nexus

Under Article VI of the Outer Space Treaty²⁰, states bear international responsibility for "national activities," encompassing both governmental and non-governmental entities. The Woomera Manual clarifies the mounting complexity of "dual-use" assets. As private entities like SpaceX or Maxar provide essential reconnaissance and communication to warring parties, the Manual suggests that these commercial actors may lose their civilian protections. By clarifying that states are legally accountable for their commercial sectors, the Manual complicates the process of attribution and highlights the risk that private infrastructure may be legally classified as a legitimate military objective.

5. Functionalism vs. Spatialism: Closing the Legal Gap

Finally, the Manual addresses the "Delimitation Dilemma" the fact that there is no internationally agreed-upon boundary where airspace ends and outer space begins. Rejecting the notion of "law-free zones," the Manual advocates for a functionalist approach. It argues

¹⁹ Kessler, D.J., Johnson, N.L., Liou, J.C. and Matney, M., 2010. The kessler syndrome: implications to future space operations. *Advances in the Astronautical Sciences*, 137(8), p.2010.

²⁰ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 610 U.N.T.S. 205. ART IV

that the legal regime is determined by the *nature of the activity* rather than the altitude. If a craft is performing an orbital manoeuvre, space law applies; if it is utilizing aerodynamic lift, air law applies. This ensures that hybrid vehicles cannot exploit "grey zones" at the edge of the atmosphere to evade legal accountability.

V. NORMATIVE GAPS AND OPERATIONAL CHALLENGES IN EXO-ATMOSPHERIC LAW

While the Woomera Manual provides a vital framework for applying existing law to space, it simultaneously exposes significant normative gaps where traditional legal doctrines struggle to accommodate the physical and technical realities of the space environment. These challenges represent the "frontier" of international legal discourse, where the line between a peaceful manoeuvre and a hostile act remains dangerously thin.

1. The Attribution Dilemma and "Grey Zone" Manoeuvres

- In space, the "smoking gun" is generally data-driven and circumstantial; in terrestrial conflict, it is often physical. There is an inherent attribution gap due to the size of the orbital environment.
- Using Ambiguity as a Weapon The Manual recognizes that "Grey Zone" strategies, such as electronic spoofing, laser "dazzling" of optical sensors, or a satellite "accidentally" drifting into a critical orbital slot, are intended to remain below the threshold of observable aggressiveness.
- The Evidentiary Burden: Proving that a satellite malfunction was the result of a deliberate cyber-attack by a specific state actor, rather than a solar flare or mechanical failure, requires a level of Space Situational Awareness (SSA) ²¹that few nations possess. This creates a legal paradox: as a state cannot exercise its right to self-defence under Article 51 of the UN Charter if it cannot legally prove the identity of the aggressor.

2. De-humanized Warfare and the Terrestrial Impact

A significant philosophical challenge to the application of International Humanitarian Law (IHL) in space is the current absence of human combatants in orbit. Traditionally, IHL is

²¹ Lal, B., Balakrishnan, A., Caldwell, B.M., Buenconsejo, R.S. and Carioscia, S.A., 2018. Global trends in space situational awareness (SSA) and space traffic management (STM).

predicated on the "principle of humanity," designed to minimize the suffering of people.

Some legal scholars argue that because space warfare is currently a kinetic or electronic exchange between uncrewed machines, calling it the "machine vs machine" argument, hence claiming, the threshold for what constitutes "harm" should be higher than on Earth.

The Woomera Manual counters this by emphasizing the terrestrial consequences of orbital interference. The "human cost" of space warfare is not found in orbit, but on the ground. The disabling of Global Navigation Satellite Systems (GNSS) or telecommunications arrays can lead to catastrophic failures in civil aviation, emergency services, and global financial markets. The Manual argues that these "cascading effects" constitute a form of civilian suffering that falls squarely within the protective mandate of IHL.

3. The "Passive Defence" Gap and Proximity Operations

The rise of Rendezvous and Proximity Operations (RPO) where one satellite manoeuvres close to another for servicing or inspection creates a unique operational challenge for defence.

- **Bodyguard Satellites:** There is a lack of clear international consensus on the legality of "bodyguard satellites" or defensive manoeuvres. If a state moves a defensive asset to intercept the path of an approaching "inspector" satellite from a rival power, is that an act of "passive defence" or a provocative "use of force"?
- **Manoeuvre-based Deterrence:** The Manual highlights that the right to "unhindered access" to space (Article I of the OST) often clashes with a state's right to protect its sovereign assets. This tension remains one of the most volatile triggers for accidental escalation.

4. Institutional Silence and the PAROS Gridlock

Finally, the Manual operates against a backdrop of diplomatic stagnation. For decades, the United Nations has been deadlocked over the Prevention of an Arms Race in Outer Space²²(PAROS).

- **Legal Fragmentation:** Because the UN Security Council and the Committee on the Peaceful Uses of Outer Space (COPUOS) have failed to produce a binding treaty on space weapons, the Woomera Manual's reliance on "interpretive" law is both a strength and a weakness.

²² Sullivan, C.D., 1990. The prevention of an arms race in outer space: an emerging principle of international law. *Temp. Int'l & Comp. LJ*, 4, p.211.

In the absence of new treaties, the Manual attempts to crystallize customary international law. However, without institutional backing or a formal verification mechanism, these 48 rules remain "soft law" – authoritative guidelines that rely on the voluntary compliance of spacefaring nations.

VI. RECOMMENDATIONS: BRIDGING THE LEGAL LOOPHOLE

To mitigate the risks of orbital escalation and resolve the normative ambiguities identified, this paper proposes a multi-layered framework of legal norms and operational protocols. By evolving the "soft law" principles of the Woomera Manual into established international standards, the global community can preserve the long-term sustainability of the space environment.

1. Codification of the "Clear Sky" Norm: A Ban on Kinetic ASATs

Kinetic Anti-Satellite (ASAT) missile testing and deployment pose the biggest urgent threat to orbital stability. A key component of space-LOAC should be the establishment of an international prohibition on ASAT testing that produce debris.

This makes the case that the production of persistent orbital debris ought to be considered a fundamental transgression of the Principle of Distinction. Debris acts as an "indiscriminate weapon" that is unable to discern between military targets and protected civilian assets due to its intrinsic lack of guidance and decades-long persistence.

2. Formal Adoption of the Woomera and MILAMOS Manuals

In order to get past "legal fragmentation," states need to agree on how current accords relate to contemporary fighting.

The suggestion is that a consensus-based handbook combining the advantages of the Woomera Manual and the Manual on International Law Applicable to Military Uses of Outer Space (MILAMOS) be formally adopted by the international community.

Similar to the San Remo Manual on International Law Applicable to Armed Conflicts at Sea, these texts need to be the go-to source for military leaders and legal counsel when organizing space operations.

3. Spatial De-confliction: Protected Orbits and "Safety Zones"

Military miscalculation cannot be prevented by the current "first-come, first-served" policy for

orbital slots.

We suggest setting aside particular "orbital shells" just for vital services like climate monitoring and GNSS (GPS/Galileo), making them unsuitable for military manoeuvring or kinetic conflict and utilising them as "Civilian-just Orbits".

The legal framework should acknowledge states' rights to create non-exclusionary "Safety Zones" around their assets in order to close the "Passive Defence" gap. Unauthorized entry into these areas would give rise to a legal foundation for non-kinetic interference or diplomatic protest, but it would not always result in an armed reaction.

4. Operational Transparency and Tactical "Hotlines"

One of the key causes of escalation in the space domain is misinterpretation of purpose.

This study suggests establishing a multilateral "Space Situational Awareness (SSA) Hotline." This would make it easier to communicate in real time about orbital manoeuvres that could otherwise be interpreted as aggressive.

To reduce the possibility of "accidental" collisions being construed as acts of war, governments should be obliged to give advance notification of proximity operations, building on the Registration Convention.

5. Accountability for Dual-Use and Commercial Actors

The legal "shield" of civilian status needs to be made clear when the distinction between private enterprise and military capacity becomes hazier.

When a commercial satellite's "direct participation in hostilities" (DPH) makes it a viable military target, guidelines need to be set. This would guarantee that states cannot use commercial sectors to carry out deniable military operations and provide private operators clear "red lines."

VII. CONCLUSION

Outer space is no longer a legal frontier; it is a vital organ of modern civilization. Extending the Laws of Armed Conflict to space is not merely an academic exercise, it is an existential necessity. While the 1967 Outer Space Treaty provides the skeleton, a new body of "Space legislature" must be fleshed out to address the realities of debris, dual-use technology, cyber-vulnerability and used of any form of armed weapons. We must ensure that "War Beyond Borders" does not result in a world without a future in the stars.

While the Laws of Armed Conflict (LOAC) are technically applicable to outer space via Article III of the OST, their implementation is hampered by the unique nature of space jurisdiction, the "dual-use" character of satellites, and the catastrophic risk of orbital debris.

To prevent space from becoming an unregulated battlefield, the international community must move beyond the 1967 framework and codify specific "Rules of Engagement" for the 21st-century orbital reality.

