Too Close for Comfort? Applying the Principle of Distinction to Rendezvous and Proximity Operations in Space

Kunyang Li

Institute of International Law, Zhongnan University of Economics and Law (Wuhan, China).
Email: kyl.likunyang@outlook.com
https://orcid.org/0009-0001-9144-5157

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Rendezvous and proximity operations of satellites, given their dual-use nature, pose significant challenges to traditional outer space security and raise questions regarding the application of international humanitarian law (IHL). Although existing IHL lacks specific rules for armed conflict in space, its fundamental principles remain applicable. In this context, the principle of distinction faces two major challenges: first, the ambiguity in determining whether commercial space operators are engaged in "direct participation in hostilities" (DPH), particularly in light of the "delayed effects" inherent in space operations; and second, the lack of clear criteria for classifying dual-use satellites as military objectives.

This article argues that, in assessing DPH, civilian satellite operators generally do not qualify due to the absence of a direct causal link, though exceptions may arise in specific circumstances. In particular, taking into account the delay effects in space operations, personnel who have left duty but whose actions or the effects thereof are still ongoing should be regarded as remaining engaged in DPH. Regarding the identification of military objectives, states should adhere to the "reverse distinction principle," visually and physically separating military systems from civilian ones. For dual-use satellites, whether they constitute a military objective as a whole should be determined based on the factual "separability" of their functions, rather than solely on the attacker's technical capabilities.

Keywords: outer space, international humanitarian law, commercial satellites, rendezvous and proximity operations

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Introduction

The rapid advancement of human space technology is profoundly reshaping the future landscape of warfare and national security through the militarization of space capabilities. On 4 March 2022, the French Institute of International Relations (IFRI) published a report titled The Military Use of Small Satellites in Orbit, which highlighted that future small satellites would exhibit a trend of "military-commercial integration." Notably, their Rendezvous and Proximity Operations (RPO) capabilities – applicable to reconnaissance and anti-satellite strikes – pose significant threats to outer space security due to the difficulty in their detection and identification (Borowitz, 2022). Against this backdrop, the United States had already established the U.S. Space Force as early as 2019, explicitly designating space as a warfighting domain and systematically advancing its space operational capabilities. This move subsequently prompted emulation by other nations, further accelerating the militarization of space and posing severe challenges to global strategic stability.

In stark contrast to the rapid technological progress, the international legal framework governing outer space activities exhibits significant regulatory lag. It not only struggles to address emerging legal issues posed by novel space technologies but also lacks clarity regarding applicable rules for long-standing concerns such as the militarization, weaponization, and military confrontation in outer space (Zhao, 2019). However, as emphasized by the International Committee of the Red Cross (ICRC), examining the applicability of International Humanitarian Law (IHL) does not conflict with the principle prohibiting the use of force or the peaceful use of outer space. Its purpose is not to legitimize or encourage the weaponization of space, but rather to limit the potential humanitarian costs of hostilities in this domain (ICRC, 2022).

Accordingly, this article focuses on the application of RPO – a representative dual-use space technology – in armed conflicts and analyzes the legal consequences that may arise under the principle of distinction in IHL.

1. The Dual-Use Nature of RPO Technology

Since its inception, RPO technology has inherently possessed distinct dual-use potential. In peaceful applications, it serves as a critical commercial capability for on-orbit servicing, satellite life extension, debris removal, and maintaining orbital sustainability. Conversely, in military contexts, the fundamental capacities of RPO – including close proximity operations, object identification, and interaction – endow it with inherent potential to facilitate orbital disruption, close-in reconnaissance, and even anti-satellite operations (Merrill, 2025).

1.1 *Civilian Applications of RPO Technology*

As a mature space operations technology, RPO is demonstrating increasingly broad prospects for peaceful applications in outer space, primarily through on-orbit servicing (OOS) and active debris removal (ADR).

In terms of OOS capabilities, which encompass tasks such as satellite maintenance and refueling (Harris, 2025), the core value of RPO lies in its ability to effectively address the dual constraints on a spacecraft's operational lifespan – limited fuel reserves and insufficient component durability (Sobeck, 2018). By performing refueling or fault repairs via RPO, the service life of spacecraft can be significantly extended, thereby enhancing the overall economic efficiency of space assets (Duke, 2021). A notable example is Northrop Grumman's Mission

Extension Vehicle-1 (MEV-1), which in 2019 successfully docked with the nearly fuel-depleted Intelsat 901 satellite using RPO technology, took over its attitude and orbit control, and substantially prolonged its operational life without modifying the original satellite (Henry, 2020). This achievement validated the practical engineering value of RPO-based satellite life-extension solutions.

Regarding ADR capabilities, RPO technology serves as a critical means for removing defunct satellites or orbital debris, thereby maintaining the long-term stability of the orbital environment (Martin, 2019). According to NASA statistics, there are over 26,000 trackable orbital debris objects larger than 10 cm in low Earth orbit – each capable of catastrophically destroying a spacecraft – along with more than 100 million smaller fragments that can still penetrate typical spacecraft shielding (NASA, 2021). In response to this severe situation, ADR has been recognized as a strategic mission to ensure the safety of space activities and sustain the long-term usability of orbital regions. For instance, the European Space Agency's ClearSpace-1 mission utilizes RPO technology to remove numerous defunct satellite remnants from orbit, underscoring its pivotal role in debris clearance and orbital sustainability. Similarly, China's SJ-21 satellite demonstrated the country's technological advancement in ADR and sustainable space utilization by capturing a decommissioned BeiDou navigation satellite and relocating it to a graveyard orbit approximately 3,000 km above the geostationary belt (Werner, 2022).

1.2 Military Applications of RPO Technology

Professor He defines "space militarization" to be the use or passing through of outer space with military purpose or the development and installation of space weapons (He, 1992). Accordingly, space militarization includes the following two types of activities: first, the military use of satellite for image reconnaissance, electronic reconnaissance, marine monitoring, meteorological observation, telecommunications, early warning and navigation, which can support and strengthen the effectiveness of ground-based conventional weapons and military operations and second, the development and installation of space-based weapons to attack or destroy the target on the earth, at sea or in airspace, or interfere with its normal operation, or the development and installation of ground-based space weapons to attack or destroy the target in outer space or interfere with its normal operation (Zhao, 2019).

In this broader context, the militarization risks of on-orbit servicing technologies, particularly RPO, have become increasingly pronounced. The most salient manifestation lies in the "co-orbital anti-satellite" (co-orbital ASAT) operational model. In such operations, an attacking spacecraft positions itself within the orbital plane of the target satellite and, through RPO capabilities, incrementally approaches to conduct surveillance or offensive maneuvers. These spacecrafts can serve as autonomous or semi-autonomous Anti-Satellite Weapon (ASAT) modules designed to deliberately destroy or disable their targets. Because the attacker and the target share the same orbital trajectory, such operations are exceedingly difficult to detect or anticipate, thus exhibiting high levels of concealment and operational lethality (Beard, 2024). For instance, satellites employing RPO technologies for legitimate commercial purposes – such as debris-removal missions that tow defunct satellites from geostationary to graveyard orbit – simultaneously possess latent military potential, enabling them to maneuver, interfere with, or even capture and disable other spacecraft using robotic arms (Werner, 2022).

Beyond physical destruction, RPO can also facilitate non-destructive orbital interference (Weeden, 2023). A satellite equipped with jamming functions can suppress or block the

communication signals of nearby targets or intercept transmitted data when operating in close orbital proximity. Such interference does not physically destroy the satellite but can effectively paralyze its functions, representing a form of "soft-kill" capability.

With the rapid proliferation of satellites, global tracking and identification capacities have approached their operational limits. Even states with advanced space surveillance networks struggle to defend effectively against co-orbital threats enabled by RPO technologies. In practice, the threatened party often has no choice but to undertake evasive maneuvers. A notable example occurred in 2022, when a Chinese satellite reportedly adjusted its orbit to avoid a close approach by a U.S. GSSAP satellite (Werner, 2022). Since orbital positions are typically mission-specific, such maneuvers consume valuable propellant and may prevent satellites from fulfilling their designated functions (Johnson, 2023). The 2022 close-approach incident between Chinese and U.S. satellites thus exemplifies the military use of RPO capabilities and underscores the complex challenges these technologies pose to the existing security order in outer space.

2. The Legal Basis for Applying IIHL in Outer Space

As a set of international legal rules regulating armed conflict, contemporary IHL has primarily developed in the context of traditional land, sea, and air warfare, and has yet to establish specific norms applicable to outer space. However, as Professor Zhao has observed, the evolving security landscape in outer space – marked by ongoing weaponization and an intensifying arms race – significantly increases the likelihood of military confrontations escalating into armed conflict, making the application of IHL both necessary and legitimate (Zhao, 2019). Judging from the normative systems of Outer Space Law and IHL, as well as international practice, the fundamental principles of IHL regulating the conduct of hostilities possess a legal basis for application to armed conflict in outer space.

From the perspective of the normative system, Article III of the Outer Space Treaty establishes that the exploration and use of outer space must be carried out in accordance with international law and the fundamental principles of the Charter of the United Nations. Article 1 of the UN Charter clearly states that one of its purposes is "promoting and encouraging respect for human rights and for fundamental freedoms for all". As an important branch of international law, IHL substantially embodies the concretization and institutionalization of the UN Charter's purpose of promoting and safeguarding human rights. Therefore, its principles can likewise apply to activities in outer space (Hobe, 2009). Furthermore, Common Article 1 of the Geneva Conventions stipulates that the High Contracting Parties "undertake to respect and to ensure respect for the present Convention in all circumstances." The phrase "in all circumstances" in this article indicates the broad scope of the Convention's application, which should include any armed conflict, whether present or future, anticipated or unanticipated (Stephens, 2015). Article 35 of Additional Protocol I to the Geneva Conventions (AP I) states that the right of the Parties to the conflict to choose methods or means of warfare is not unlimited. Article 36 further clarifies that when a Party studies, develops, acquires, or adopts a new weapon, it must determine whether its employment would be prohibited by the Protocol or any other rule of international law applicable to the Party. Consequently, most ASATs, particularly those utilizing RPO technology as operational modules, should evidently be categorized as "new weapons" urgently requiring regulation through IHL.

3. Challenges to and Responses on the Principle of Distinction in the Context of RPO Technology

The principle of distinction, as a cornerstone of international humanitarian law for the protection of civilians, requires parties to armed conflicts to always distinguish between civilians and combatants, as well as between civilian objects and military objectives, and to direct operations only against combatants and military objectives (Henckaerts, 2007). In the context of armed conflict in outer space, the application of the principle of distinction to objects involving RPO technology raises several complex legal issues. These include, first, whether employees of commercial space companies can still be regarded as civilians enjoying protection from attack if they engage in direct participation in hostilities (DPH), and second, whether dual-use satellites lose their protected status as civilian objects due to their military functionality.

3.1 DPH by Employees of Commercial Space Companies

Commercial space systems inherently possess a dual-use character: while nominally owned and operated by commercial entities, they remain susceptible to military application (Berrang, 2023). In practice, military space capabilities often depend on platforms, services, or personnel provided by commercial companies.

Under IHL, a "civilian" is defined negatively as any person who does not belong to the armed forces nor participates in a levée en masse.[1] A levée en masse specifically refers to inhabitants of a non-occupied territory who, on the approach of the enemy, spontaneously take up arms to resist the invading forces without having had time to form themselves into regular armed units.[2] For a group to qualify as armed forces under AP I, it must satisfy a "sufficient degree of organization,"[3] generally encompassing four cumulative criteria: (1) being under a command responsible for its subordinates; (2) having a fixed distinctive emblem recognizable at a distance; (3) carrying arms openly; and (4) conducting operations in accordance with the laws and customs of war.[4] Commercial space companies typically lack such a military structure, as their primary objective remains the pursuit of commercial profit (Berrang, 2025). Consequently, their personnel are generally considered civilians under IHL, as they are neither members of the armed forces nor participants in a levée en masse. This leads to a pivotal legal question: during an armed conflict in outer space, would civilian employees of commercial space companies, by operating space systems used for military activities, be considered as DPH, thereby losing their protection against direct attack for the duration of such participation?

[1] ICRC (1977) Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), Article 50. Adopted 8 June 1977; opened for signature 12 December 1977; entered into force 7 December 1978. Retrieved from https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/article-50.

[2] ICRC (1949) Geneva Convention Relative to the Treatment of Prisoners of War (Third Geneva Convention), Article 4(1)(6). Adopted 12 August 1949; entered into force 21 October 1950. Retrieved from https://ihl-databases.icrc.org/en/ihl-treaties/gciii-1949/article-4.

[3] Supra 1, Article 43(1).

[4] ICRC (1949) Geneva Convention for the Amelioration of the Condition of the Wounded, Sick and Shipwrecked Members of Armed Forces at Sea (Second Geneva Convention), Article 13(1), (2), (3), (6). Adopted 12 August 1949; entered into force 21 October 1950. Retrieved from https://ihl-databases.icrc.org/en/ihl-treaties/gcii-1949/article-13/commentary/2017.

Assessing DPH Through Operational Roles

"DPH" refers to specific acts carried out by individuals as part of the conduct of hostilities between parties to an armed conflict (Melzer, 2009). As a cornerstone of the principle of distinction, civilians lose their immunity from direct attack for such time as they directly participate in hostilities. The ICRC Interpretive Guidance establishes a threefold cumulative criteria for determining direct participation: (1) the act must be likely to adversely affect the military operations or military capacity of a party to the conflict or, alternatively, to inflict death, injury, or destruction on protected persons or objects (threshold of harm); (2) there must be a direct causal link between the act and the harm likely to result (direct causation); and (3) the act must be specifically designed to directly cause the required threshold of harm in support of a party to the conflict and to the detriment of another (belligerent nexus) (Melzer, 2009). Therefore, whether the acts of employees of commercial space companies constitute DPH during a space conflict must be determined on a case-by-case basis.

Generally, employees of commercial space companies are typically responsible for the daily operation or maintenance of commercial satellites. Their activities are far removed from the requirements of "direct causation" and "belligerent nexus," and thus do not constitute direct participation in hostilities. For instance, if a satellite operated by a commercial company is used by the military to conduct an ASAT attack against an adversary's satellite, the civilian operators ensuring its normal function – such as technicians adjusting its orbit or monitoring its status – are not engaged in DPH. Admittedly, the work of these operators is crucial for maintaining the satellite's functionality and may indirectly benefit one party to the conflict to the detriment of another. However, the personnel actually executing the ASAT attack mission by utilizing the satellite are typically military members qualifying as combatants. Consequently, as the activities of civilian satellite operators struggle to meet the "direct causation" requirement, they are not considered DPH.

However, under specific circumstances, employees of commercial space companies may indeed engage in DPH. For example, if an employee directly controls a satellite and employs RPO technology to conduct reconnaissance missions aimed at obtaining intelligence advantageous for military operations – such as transmitting military satellite imagery to the armed forces – this conduct would likely qualify as DPH (Berrang, 2023). More broadly, whenever commercial space employees operate RPO technology for military purposes, their actions typically fall within the IHL definition of DPH.

This assessment relies on the key criteria set out in the ICRC Interpretive Guidance. First, the act must meet the "threshold of harm." Under this criterion, "military harm" encompasses not only direct physical damage to military personnel or objects but also significant adverse effects on the military operations or capacity of a party to the conflict. Examples include interfering with an adversary's satellite usage or transmitting tactical intelligence, both of which fall squarely within this scope (Melzer, 2009). In practical military scenarios, RPO technology may impact adversary satellite systems through physical destruction (e.g., in-orbit capture or collision), electronic warfare (e.g., signal jamming), orbital manipulation (e.g., altering orbital parameters), or intelligence reconnaissance. Each of these actions can directly degrade an adversary's military capacity or disrupt its operations, thereby satisfying the "military harm" requirement.

Second, the act must exhibit a direct causal link between the employee's operation of RPO technology and the resulting military harm. In such cases, the employee's conduct constitutes the core operational action directly targeting the military objective, rather than indirect

logistical support or technical assistance. No intervening factors break the chain of causation, thus fulfilling the requirement for a direct link between the act and the harm.

Finally, concerning the subjective intent and nature of the act, such operational conduct possesses a clear "belligerent nexus". The immediate purpose of the employee operating the RPO technology is to provide military support to one party to the conflict and, by acting upon the adversary's satellite system, directly harm the military interests of the other party. This conduct transcends ordinary commercial service and becomes deeply embedded within the military operational system of one conflict party, demonstrating the subjective intent requisite for DPH.

The Temporal Scope of DPH

Determining whether employees of commercial space companies engage in DPH does not stop at assessing the nature of their conduct. A more intricate issue lies in the temporal dimension: if civilian space operators, in the course of their routine duties, perform acts that meet the threshold of DPH, does such participation have a continuous character? In other words, could these operators be deemed to engage in DPH on multiple occasions while performing military missions, yet revert to civilian status – and regain the protection afforded by IHL – during periods when they are not engaged in such missions, such as when they have completed their work, left their posts, or "gone off duty"?

According to the ICRC Interpretive Guidance, a civilian's direct participation should be confined to specific phases of activity – namely, the preparatory and deployment phase (e.g., carrying weapons to the site of attack), the execution phase (e.g., carrying out the attack), and the disengagement phase (e.g., withdrawal from the area of attack) (Melzer, 2009). Activities beyond this temporal scope – such as prior logistical support, technical maintenance, or post-action rest and reorganization – do not amount to direct participation. This temporal limitation embodies the so-called "revolving door mechanism," under which civilians' loss of protection is only temporary and lasts solely for the duration of their direct participation. Once the relevant act ceases, civilian protection is automatically restored. Accordingly, if civilian space operators engage in satellite operations only during a specific military mission, they may be deemed to engage in DPH during that mission. However, once the mission is complete and they have left their posts, they should regain civilian status and the corresponding protection under IHL. While this interpretation imposes greater operational burdens on armed forces, the ICRC argues that it prevents erroneous or arbitrary attacks on civilians and thus should be regarded as a fundamental safeguard rather than a flaw within IHL (Melzer, 2009).

Nevertheless, the "revolving door" mechanism has generated significant scholarly debate. Margulies further observes that such imbalance lowers the legal risks and thresholds associated with civilian participation in hostilities and may encourage ambiguous conduct – so-called "farmers by day, fighters by night" – thereby undermining States' overall compliance with IHL (Margulies, 2012). Huston argue that civilians who repeatedly participate in hostilities often engage in withdrawal and preparation activities between operations; thus, these intervals should not be excluded from the scope of DPH. (Huston, 2018) Watkin goes further, suggesting that the concept of "continuous combat function" should extend to civilians: once civilians perform combat-related functions of a continuous nature, they should be regarded as legitimate military targets (Watkin, 2014).

The temporal scope of DPH has long been debated under traditional IHL and becomes even more complex in the context of space warfare. Space operations exhibit a distinct delay effect: ASAT weapons often involve a temporal gap between launch and impact, while co-

orbital satellite attacks require prolonged orbital approach and adjustment, making it difficult to determine the precise beginning and end of hostile acts. Moreover, operations such as electronic interference, laser dazzling, or intrusions into satellite control systems may generate delayed effects, further blurring the line as to whether civilians or operators remain in continuous DPH during such intervals.

The temporal boundaries of DPH are particularly complex in outer space armed conflict. Space operations often involve significant delay effects: satellites or systems may be programmed or remotely controlled to act only under specific conditions (e.g., enemy satellites approaching or reaching particular orbital positions), or to perform tasks later, such as disabling communications, adjusting orientation, or deploying payloads. These effects often materialize after a delay, making it difficult to determine the precise start and end of hostile acts, and further blurring whether operators remain continuously engaged in DPH. A practical issue arises when operators have completed their shifts but the hostile actions or their effects are still unfolding – should off-duty personnel still be considered direct participants? Similar problems exist in cyber operations, where attacks may only trigger under certain conditions (e.g., logic bombs lying dormant until activated).

Given these parallels, this article argues that the rules developed for cyber armed conflict, particularly those reflected in the expert-consensus-based Tallinn Manual, can inform the temporal boundaries of DPH in space. According to the Tallinn Manual 2.0, the majority of experts hold that the period runs from the planning of a logic bomb to its activation, regardless of actual triggering, while a minority treat deployment and activation as separate acts, such that the interval does not restore civilian protection (Schmitt, 2017).

Regardless of the view adopted, it follows that in the context of space armed conflict, operators who have completed their shifts and left their posts while relevant hostile actions are still ongoing or their effects are still unfolding should continue to be regarded as DPH. Only when a task is fully completed and operators have completely disengaged from their duties – such that their actions no longer have an immediate impact on the enemy's military capabilities and the objective criteria for DPH are no longer met – should they be considered civilians again and regain the protections afforded under IHL.

3.2 The Classification of Dual-Use Satellites as Military Objectives

Article 52(2) of AP I defines military objectives as "those objects which by their nature, location, purpose or use make an effective contribution to military action and whose total or partial destruction, capture or neutralization, in the circumstances ruling at the time, offers a definite military advantage." This provision clarifies two cumulative criteria that must be met for an object to qualify as a military objective: first, the object must make an effective contribution to military action; and second, its total or partial destruction, capture, or neutralization must, in the circumstances prevailing at the time, offer a definite military advantage. Accordingly, if a commercial satellite satisfies both criteria, it should be classified as a military objective, regardless of whether it also serves civilian purposes (Stephens, 2024).

However, as the militarization of outer space accelerates, dual-use technologies have become deeply integrated across various composite operational systems, blurring the distinction between military and civilian objects. In this context, the application of the principle of distinction faces two main challenges: (1) States often conceal the true nature of their satellite activities, making it difficult in practice to determine whether a given satellite's RPO technology serves peaceful or military purposes; and (2) in the case of satellite systems performing both

civilian and military functions, the question arises as to whether the entire satellite should be treated as a military objective, or only those components that actually contribute to military operations.

The Challenge of Identifying Satellite Purposes

Article 11 of the Outer Space Treaty requires States Parties to inform the UN Secretary-General, the public, and the international scientific community of the nature, orbital parameters, and purpose of their outer space activities, with a view to ensuring transparency and the peaceful use of outer space.[5] In theory, a State Party conducting a mission involving RPO technology is expected to truthfully report the mission's objectives to allow international scrutiny. In practice, however, this obligation is rarely fulfilled. Similarly, although Article 4 of the Registration Convention expressly requires launching States to register basic information about their space objects,[6] thereby providing a potential mechanism for oversight of all space activities, the implementation of this regime remains limited in practice.

First, the Registration Convention does not specify a time frame for registration, and States – often motivated by security and confidentiality concerns – tend not to continuously or fully disclose the true nature of their space activities (Masson-Zwaan, 2019). This lack of transparency complicates the tracking of space objects and heightens the vigilance of space actors toward any spacecraft approaching their systems – particularly those operated by entities known to possess RPO capabilities (Werner, 2022). Second, due to national security and strategic considerations, most States are reluctant to reveal the true nature of their space operations, often describing missions only in general terms while concealing their potential military functions (Lyall, 2018). Such opacity is especially acute in the realm of dual-use satellites. Because the Registration Convention imposes only minimal requirements – namely, the name of the launching State, the official designation or registration number of the space object, the date and location of launch, basic orbital parameters, and a description of its "general function" – the UN Register in practice cannot effectively reflect the real attributes of space objects (Merrill, 2025). In extreme cases, the registered information may even be misleading. For instance, USA-193, a U.S. reconnaissance satellite used for intelligence purposes, was registered merely as engaging in "meteorological or communications-related space technology." (Bloun, 2009) Although the UN General Assembly has repeatedly discussed reforming the Registration Convention, no substantive amendments have yet been adopted to enhance transparency, resulting in the increasingly blurred distinction between peaceful and military uses of outer space.

Given the strategic significance of the geostationary orbit (GEO) – which concentrates key assets such as missile warning, secure communications, and intelligence-gathering satellites – States tend to be particularly sensitive to RPO activities occurring near their national GEO assets (Johnson, 2023). However, in the absence of robust disclosure and oversight mechanisms, it remains difficult for States to determine whether satellites employing RPO technology

[5] United Nations (1967) Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Article 11. Adopted 19 December 1966; opened for signature 27 January 1967; entered into force 10 October 1967. Retrieved from https://legal.un.org/avl/pdf/ha/tos/tos_e.pdf.

[6] United Nations (1976) Convention on Registration of Objects Launched into Outer Space (Registration Convention), Article 4. Adopted 12 November 1976; opened for signature 14 January 1977; entered into force 15 September 1976. Retrieved from https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/registration-convention.html.

constitute legitimate military objectives. Conversely, States conducting intelligence-oriented RPO missions may exploit their technological superiority to conceal the true nature of their operations from actors lacking advanced space situational awareness and tracking capabilities (Johnson, 2023). This opacity, in turn, undermines the ability of armed forces to effectively apply the principle of distinction, increasing the risk of violations of IHL in the context of armed conflict in outer space.

In this regard, the IHL principle of "passive precautions" offers an important means to mitigate the problem of identifying satellite functions. Article 58 of AP I imposes an obligation on the defending party to take feasible precautions to protect the civilian population and civilian objects from the effects of attacks. This obligation – often referred to as the "principle of passive precautions" or, by some scholars, the "reverse distinction principle" (Koplow, 2022) – comprises three elements: (1) parties to a conflict must ensure that combatants and civilians, as well as military objectives and civilian objects or specially protected persons and objects, can be visually distinguished from one another; (2) to the extent feasible, they must physically separate such persons and objects; and (3) they must avoid using protected persons or objects to shield military objectives.

Applying this "reverse distinction" principle to outer space operations, parties to a conflict should take all feasible measures to enable effective differentiation between military and civilian space assets. Visually, lessons can be drawn from air and cyber operations, such as employing infrared signatures or electronic identifiers to create recognizable markings visible during hostile acts in space. Physically, defending forces should remove civilian or protected objects from the vicinity of military targets, and, where possible, provide relevant information to opposing forces to clarify the civilian nature of certain space objects.

Partial or Full Classification of Military Objectives

Due to the dual-use nature of satellite RPO technology, a core question arises when assessing military objectives: should the entire satellite be considered a military objective, or only those subsystems that make an effective contribution to military operations?

Currently, there are three main perspectives on this issue: The first view holds that a dual-use satellite as a whole may be considered a military objective, rendering considerations of collateral damage or assessments under the principles of proportionality and precaution unnecessary; the second view, while accepting that the entire dual-use satellite can be regarded as a military objective, maintains that a proportionality assessment should still take civilian components into account to balance military necessity with humanitarian principles; Schmitt, however, proposes a third approach, arguing that the definition of military objectives under Article 52 of AP I does not require treating the entire satellite as a single entity – if the civilian and military portions of a satellite system are separable, only the military components should be considered military objectives, and the feasibility of such distinction depends on the attacker's capabilities (Schmitt, 2021).

Although each of these three perspectives has a theoretical basis, limitations remain in reconciling military necessity with humanitarian principles and bridging theory with practice. First, while the first view is persuasive in emphasizing military necessity, it neglects the separable nature of space systems, which may make it difficult in practice to adequately consider humanitarian concerns. In fact, space systems consist of multiple distinguishable components, including ground segments, space segments, and uplink and downlink elements, each of which can be independently assessed both factually and legally (Dickey, 2024). Mechanically treating the satellite as a whole not only departs from a precise definition of military objectives but

may also undermine compliance with humanitarian principles. Consequently, the evaluation of satellite systems should follow a separability analysis rather than a holistic approach.

Similarly, although the second view reflects concern for humanitarian principles, it lacks explicit legal support. The proportionality principle established in Article 57 of AP I aims to protect civilians and civilian objects and is not intended to be extended to military objectives.

As for the third view, while it attempts to limit attacks by distinguishing between the civilian and military parts of a dual-use satellite, it relies heavily on the attacker's capabilities for determining separability. This reliance may lead to inconsistencies, where the same object is treated as a civilian target in some contexts and a military target in others. Armed forces with greater capabilities bear a heavier burden in fulfilling distinction obligations, while less capable forces bear a lighter burden, potentially reducing incentives for States to minimize harm to civilians during the design and deployment of satellites – contrary to the fundamental humanitarian objective of protecting civilians to the greatest extent possible.

Accordingly, the assessment of whether a dual-use satellite can be separated should be based on the factual composition of its constituent parts rather than the attacker's capabilities (Berrang, 2025). In other words, whether portions of a dual-use satellite conducting military operations using RPO technology constitute military objectives should be determined according to the distinguishability of the respective components, rather than the technological capabilities of the attacker. This position is also supported by the latest Woomera Manual on the International Law of Military Space Activities & Operations, which states that if the military and civilian parts of a satellite are physically or functionally inseparable, the satellite as a whole should be treated as a military objective; conversely, if the civilian components are distinguishable in fact, they should not be considered military objectives nor be targeted (Beard, 2024).

Conclusion

RPO technology presents both opportunities and risks: while it offers substantial commercial benefits – such as the removal of large debris from low Earth orbit or the restoration of defunct satellites under the pretext of space debris management – it also holds significant military potential, including the development of autonomous space-based weapon systems and the strengthening of a nation's strategic position in space.

Although IHL serves as the primary legal framework governing armed conflict, it has not yet established rules specifically tailored to conflicts in outer space. Nonetheless, its core principles – rooted in normative logic and international practice – provide a legal foundation for addressing the security challenges posed by RPO technology. Within this framework, the principle of distinction, a cornerstone of IHL, faces two major challenges: first, determining the civilian status of commercial space operators; and second, assessing whether dual-use satellites qualify as military objectives.

To address these challenges, this paper proposes the following regulatory approaches. In terms of civilian status, personnel who have left their posts but whose actions – or the effects thereof – continue to contribute to hostilities should still be considered as DPH, with civilian protections under international humanitarian law resuming only once their actions no longer have an immediate impact on the enemy's military capabilities. In terms of military objectives, states should give priority to the IHL "reverse distinction principle", ensuring that military and civilian systems are clearly distinguishable both physically and visually. For dual-use satellites, whether they constitute a military objective as a whole should be determined based on their

factual "separability", that is, whether their structural and functional components form a single entity, rather than on the attacker's technical capabilities.

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