

International Law and Military Operations in Space

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I. Introduction

In 1962, President John F. Kennedy, speaking at Rice University, warned:

“We set sail on this new sea because there is new knowledge to be gained, and new rights to be won, and they must be won and used for the progress of all people. For space science, like nuclear science and all technology, has no conscience of its own. Whether it will become a force for good or ill depends on man, and only if the United States occupies a position of pre-eminence can we help decide whether this new ocean will be a sea of peace or a new terrifying theater of war. I do not say that we should or will go unprotected against the hostile misuse of space any more than we go unprotected against the hostile use of land or sea, but I do say that space can be explored and mastered without feeding the fires of war, without re-

* The views expressed herein are those of the author in his personal capacity and should not be construed as the official position of either the Federal Republic of Germany or the United States.

peating the mistakes that man has made in extending his writ around this globe of ours.”¹

Yet, just four decades later, General Lance Lord, then Commander of the United States Air Force’s Space Command, would proclaim:

“Space superiority is the future of warfare. We cannot win a war without controlling the high ground, and the high ground is space.”²

For better or worse, space has become integral to 21st century warfare. Consider the United States military space infrastructure. Commanded by a four-star general, the United States Strategic Command manages US military space operations. Over 3,500 personnel man its headquarters, which controls an operating budget of nearly one-half billion dollars.³ The organization oversees space operations by each of the individual services, the bulk of which are conducted by the Air Force’s 39,000-strong Space Command.⁴ Although the Department of Defense’s overall space spending is difficult to calculate because it does not appear as a separate line item in the annual budget, the Congressional Research Service estimates it as in the 20 billion dollar range and climbing.⁵ To place this figure into perspective, it exceeds the total defense budget of every country in the European Union except France, Germany, and the United Kingdom.⁶

This should come as little surprise to those familiar with contemporary warfare. Today, space-based systems enable precision navigation; provide real-time weather data; make possible instantaneous global communications; gather intelligence and conduct surveillance and reconnaissance; and warn of missile attacks. Military space activities certainly demonstrated their centrality to 21st century warfare during Operation Iraqi Freedom (OIF). For instance, all secure communications between Coalition forces were transmitted through space, space sys-

¹ President John F. Kennedy, Address at Rice University on the Space Effort, 12 September 1962, available at <www.rice.edu/fondren/woodson/speech.html>.

² General L.W. Lord, “Space Superiority”, *High Frontier*, Winter 2005, 4.

³ U.S. Strategic Command Snap Shot, March 2006, available at <www.stratcom.mil/fact_sheets/SnapShot.doc>.

⁴ Air Force Space Command Fact Sheet, October 2005, available at <www.af.mil/factsheets/factsheet.asp?fsID=155>.

⁵ M. Smith, “U.S. Space Programs: Civilian, Military and Commercial”, Congressional Research Service Issue Brief 92011, April 2003, 9.

⁶ Based on 2004 figures. B. Schmitt, “Defence Expenditure”, EU Institute for Security Studies, February 2005, figure 1.

tems detected 26 rocket launches from Iraq, and the Predator UAVs (Unmanned Aerial Vehicles) that rendered much of the tactical battle space transparent relied on space platforms for data transmission.

Space-based assets proved especially useful in facilitating precision attacks against Iraqi forces. As an example, the upgraded MILSTAR satellite communications system transmitted the Air Tasking Order (ATO) in six seconds rather than the hour that was previously required. This allowed Coalition Forces to be instantly responsive to a dynamic battlefield, where target information is often perishable. Furthermore, precision weapons often rely on satellites for navigation data. Noteworthy in this regard is the Joint Direct Attack Munition (JDAM), which uses data from Global Position System satellites for guidance to the target. Because they are relatively inexpensive, JDAMs dramatically increase the percentage of precision strikes possible. During the high intensity phase of OIF (19 March - 18 April 2003), for instance, United States forces employed over 6,000 JDAMs. During that period, Coalition forces also mounted 156 attacks on "Time Sensitive Targets" and 686 against "Dynamic Targets." The former encompassed fleeting terrorist, leadership, or weapons of mass destruction objectives, whereas the latter included other highly mobile vital targets. Space systems made it possible to strike the targets with aircraft that were airborne and often already tasked against other targets.⁷

The integration of space-based assets into ground, air, and sea warfare will inevitably continue apace, both vertically, as new combat systems dependent on space capabilities are fielded, and horizontally, as other states enter the space age militarily. In the future, space may also become a line of communication, with systems such as the Hypersonic Space Vehicle traversing space with personnel and material onboard.⁸ Ultimately, space may well become a field of battle, with attacks conducted into, from, and within space. That prospect is envisioned in the 2004 US *National Military Strategy*, which warns that "[a]dversaries threaten the United States throughout a complex battle space, extending

⁷ On space in Operation Iraqi Freedom, see Statement of General L.W. Lord before the Senate Armed Services Committee, Strategic Forces Subcommittee, 16 March 2005; Brigadier General L. James, "Bringing Space to the Fight: The Senior Space Officer in Operation Iraqi Freedom", *High Frontier*, Summer 2005, 14; USCENAF, "Operation Iraqi Freedom: By the Numbers", 30 April 2003.

⁸ For a description, see Defense Advanced Research Agency, *Bridging the Gap*, February 2005, 23-24.

from critical regions overseas to the homeland and spanning the global commons of international airspace, waters, space and cyberspace”⁹ and cautions that the United States must secure “space approaches” to its territory.¹⁰ The February 2006 Department of Defense *Quadrennial Defense Review*, intended to “determine and express the defense strategy of the United States and establish a defense program for the next 20 years,”¹¹ foresees space as a battlefield with even greater specificity. In particular, it notes that China will likely seek counter-space capability.¹² It goes on to predict, however, that:

“The United States should continue to enjoy an advantage in space capabilities across all mission areas. This advantage will be maintained by staying at least one technology generation ahead of any foreign or commercial space power. The Department will continue to develop responsive space capabilities in order to keep access to space unfettered, reliable and secure. Survivability of space capabilities will be assured by improving space situational awareness and protection, and through other space control measures.”¹³

Despite current American preeminence, other nations are increasingly fielding military space systems. Notable in this regard is an initiative launched by the European Union and European Space Agency, *Galileo*. *Galileo* will consist of 30 satellites performing roughly the same functions as the Global Positioning System and should be fully operating in 2008. Also of note is the French military space program. The French have placed remote sensing (HELIOS and PLEIADES), electronic-intelligence gathering (ESSIAM), and communications (SYRACUSE) satellites into space.¹⁴ Of course, the Russians have had a

⁹ Joint Chiefs of Staff, *The National Military Strategy of the United States of America*, 2004, 5.

¹⁰ *Ibid.*, 10.

¹¹ 10 United States Code 118, which legislatively mandates preparation of the *Quadrennial Defense Review*.

¹² Department of Defense, *Quadrennial Defense Review*, 6 February 2006, 29.

¹³ *Ibid.*, 55-56.

¹⁴ Center for Nonproliferation Studies, “Current and Future Space Capability: France, Military Programs”, available at <cns.miis.edu/research/space/france/mil.htm>.

comprehensive military space program for decades, albeit one that is cash-starved.¹⁵

Globalization has even reached space. Today, almost 70 nations are involved in space operations to some extent, often through the lease of commercial services.¹⁶ As an example, the Federal Republic of Yugoslavia leased a transponder contained in EUTELSAT, the European Telecommunications Satellite, to broadcast propaganda during its 1999 conflict with NATO.¹⁷ And in 2006, Brazil, China, France, India, Israel, Italy, Japan, Pakistan, Russia, Ukraine, United Kingdom, United States, and the European Space Agency possess advanced space launch capability.¹⁸ The “space faring” club is growing.

This article explores the relationship between military space operations and international law, including international humanitarian law. As the United States dominates the field, its space operations paradigm serves as the template for analysis. The article begins by examining the nature of space operations to enable placement of the law into context. This is an essential task, for international law, if it is to remain meaningful over time, it must be interpreted in light of the environment to which it applies. This is especially true in the case of humanitarian law, no part of which came into force in contemplation of space warfare. The article then moves to the handful of space law treaties to determine the extent to which they may limit military space operations. It concludes with a discussion of the applicability of humanitarian law to war in space, and to those aspects thereof most likely to come into play during any such conflict.

¹⁵ For a description, see Federation of American Scientists, “Russia and Military Space Projects”, available at <www.fas.org/spp/guide/russia/military/index.html>.

¹⁶ J.R. Labbe, “Let’s Keep Advantage in Space”, *Miami Herald.com* of 6 August 2005, available at <www.miami.com/mld/miamiherald/news/opinions/12316978.htm>.

¹⁷ US Air Force, *Space Operations*, Doctrine Document 2-2 of 27 November 2001, 33-34.

¹⁸ Center for Nonproliferation Studies, “Countries with Advanced launch Capabilities”, available at <cns.miis.edu/research/space/spfrnat.htm>.

II. The Nature of Military Space Operations

Space offers unique advantages to the war fighter.¹⁹ Among them, global access is preeminent. Because space is borderless, there are no normative barriers impeding access to any point within space. Thus, space represents the apogee of what combat commanders have sought for centuries, “the high ground.” The extent to, and period during, which air and terrestrial activity can be observed from space depends on an array of factors: sensitivity and/or power of the sensing system, weather on earth, number of satellites performing the function, type of orbit, and so forth. However, at least in principle, from space there is no point on the earth’s surface or in the airspace lying above it that is immune from space observation. Should space-based weapons be developed, the same exposure would apply to earth-based targets.

Space also offers persistency of coverage. Unlike aircraft or ground vehicles, spacecraft are unencumbered by earthly features such as terrain or atmospheric density. Instead, orbital mechanics determine their flight parameters. As a result, spacecraft can move at extremely high speeds and orbit the earth for long periods, years in some cases.

There are limitations. Orbits are predictable, which allows the enemy to engage in unobserved activity between passes. Depending on the nature of the orbit, a particular point of interest might be in the satellite’s field of view for just a few minutes. Only geosynchronous orbits, i.e., those that mirror the earth’s revolution, allow satellites to remain over a specified location on earth.²⁰ Therefore, it is often neces-

¹⁹ For a discussion of these characteristics, see Joint Chiefs of Staff, *Joint Doctrine for Space Operations*, Joint Publication 3-14 of 9 August 2002, at I-3 – I-4.

²⁰ There are five types of orbits. Low earth orbit is the lowest and offers the best opportunity for high-resolution imagery, but has a smaller field of view and missions are typically shorter due to atmospheric drag. It is used for manned flight, reconnaissance, and communications. Medium earth orbit, which is higher and has a longer dwell time, is used for navigation systems such as GPS. Polar orbits fly over the poles, which can provide coverage of the entire earth. They are useful for weather observation and reconnaissance, including that of troop movements. Highly elliptical orbits offer the largest field of view on the side of the earth from which the satellite travels farthest. They are used in communications and intelligence, surveillance, and reconnaissance (ISR) missions. Finally, geosynchronous earth orbits have orbital periods equal to that of the earth, thereby allowing a satellite to remain over a single point of interest. For this reason, they are

sary to employ a constellation of satellites to maintain continuous coverage, as is the case with the Global Positioning System.

A further limitation of satellites is their vulnerability. Although few states possess the capability to attack satellites directly while spaceborne, the ground-based systems and facilities on which they rely may be targeted to neutralize them, either through classic kinetic attack or information warfare, such as computer network attack. Of course, signals to and from satellites may be jammed, altered, or monitored. Satellites are also held back by launch and maintenance hurdles. It typically takes well over a month to launch a satellite, thereby limiting their responsiveness. Once spaceborne, satellites and other spacecraft are difficult to replenish, maintain, or repair.

United States joint (i.e., all military services) doctrine categorizes military space activities into one of four “mission areas”: space control, space force enhancement, space force application, and space support.²¹ Space control includes “combat, combat support, and combat service support operations to ensure freedom of action in space for the United States and its allies and, when directed, deny an adversary freedom of action in space.”²² Military jargon aside, space control missions ensure you have access to space and that the enemy does not. They encompass such activities as monitoring space, protecting friendly space-based systems, and preventing the adversary’s use of space for detrimental purposes.

Although the distinction does not appear in joint doctrine, the United States Air Force further subdivides space control into offense and defensive components.²³ The former seek to hinder the enemy’s ability to exploit space by targeting (with either lethal or non-lethal means) its space systems, ground-based space assets, space personnel, data links, or space services provided them by third parties. Methods include the use of deception, disruption, denial, degradation, and destruction, known as the “5Ds”. Deception involves manipulating, distorting, or

used for communications, weather, and ISR. Some satellites operate in constellations, i.e., in groups. This occurs when a single satellite is insufficient for coverage. An example is the GPS constellation, which ensures constant GPS coverage everywhere.

²¹ Joint Publication 3-14, see note 19, Chapter IV.

²² Department of Defense, *Dictionary of Military Terms*, as amended through 31 August 2005, available at <www.dtic.mil/doctrine/jel/doddict/>.

²³ United States Air Force, *Counter space Operations*, AF Doctrine Document 2-2.1 of 2 August 2004, 3.

falsifying information, such that the enemy will act in a manner contrary to its best interests. Disruption is temporarily impairing a space activity, whereas denial is temporarily eliminating a particular space capability. Typically, deception, disruption, and denial do not cause physical damage. Degradation and destruction typically do. Degradation is the permanent impairment of a space system's capability, whereas destruction is permanently eliminating capability.

Defensive counter space operations, which act to preserve friendly space capabilities, may be active or passive. Active measures detect, track, identify, characterize, intercept, or negate threats. Passive measures hinder enemy efforts to affect your operations. Examples include encrypting data or hardening facilities against attack. For policy and legal reasons, the United States has an expressed preference for passive measures.²⁴ That said, the United States would not take interference with its space systems lightly, even during peacetime. As noted in a Secretary of Defense Memorandum setting forth space policy:

“Purposeful interference with US space systems will be viewed as an infringement on [US] sovereign rights. The US may take all appropriate self-defense measures, including, if directed by the [President or Secretary of Defense], the use of force, to respond to such an infringement on US rights.”²⁵

Space force enhancement missions augment operations in other arenas of conflict by sharpening the war fighter's situational awareness or directly contributing to ground, sea, or air operations. Joint doctrine subdivides force enhancement into five general categories: intelligence, surveillance, and reconnaissance (ISR)²⁶; integrated tactical warning and attack assessment; environmental monitoring; communications; and position, velocity, time, and navigation. The first represents the traditional

²⁴ US Air Force, *Transformation Flight Plan*, 2004, 59 & D-21.

²⁵ Secretary of Defense, *Memorandum, Space Policy* of 9 July 1999, 3.

²⁶ Intelligence is “the *product* resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information concerning foreign countries or areas.” Surveillance is the “*systematic observation* of aerospace, surface, or subsurface areas, places, persons, or things, by visual, aural, electronic, photographic, or other means.” Reconnaissance is “a *mission* undertaken to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or potential enemy, or to secure data concerning the meteorological, hydrographic, or geographic characteristics of a particular area,” DoD Dictionary, see note 22.

role for space-based systems. It involves such critical tasks as searching for and monitoring enemy position and strength (order of battle), warning of impending attack, and assessing the results of friendly strikes (Battle Damage Assessment – BDA). Integrated tactical warning and attack assessment refer to detection of enemy missile activity or nuclear detonation, whereas environmental monitoring encompasses collection of data on meteorological, oceanographic, and space environmental factors of relevance to military operations. Space-based communications are the key to effective network-centric warfare, in which friendly forces leverage information technology to operate synergistically.²⁷ The final category – position, velocity, time, and navigation – employs space-based systems to boost the effectiveness of non-space-based military operations, particularly precision in attacks.²⁸

The space force application mission area presently exists only as a notional activity. In space force application, space-based systems (or systems traveling through space) target ground, sea, and air-based targets. Currently, no state fields a space force application capability. However, the fact that this mission area finds its way into both joint and Air Force doctrine is telling. Indeed, the current Strategic Master Plan for Air Force Space Command specifically discusses the mission, setting timelines for funded development of two potential space weapons capable craft, the Common Aero Vehicle (CAV) and the Space Operations Vehicle (SOV).²⁹ The CAV is an unpowered, highly maneuverable hypersonic glide vehicle that would be carried into space by, e.g., an SOV. Once in space, the CAV would dispense conventional weapons or other items, such as sensors, against targets. Because of its location and maneuverability, it would be especially useful against mobile and other time-sensitive targets. The SOV will provide spacelift by transporting CAVs, satellites, and other payloads to and from space.

²⁷ On network-centric warfare, see Office of the Secretary of Defense, *Network-Centric Warfare: Creating a Decisive War fighting Advantage*, Winter 2003.

²⁸ Accuracy is the relative ability of a weapon to strike an aim point, i.e., the point the attacker wants the weapon to impact. Precision is the ability to create desired effects with minimal collateral damage. Restated, precision is the ability to correctly identify targets in a timely fashion and to strike those targets very accurately.

²⁹ Air Force Space Command, *Strategic Master Plan: FY 06 and Beyond* of 1 October 2003, 27-29.

Also indicative of the likelihood of space becoming a field of battle is the United States Air Force's *Transformation Flight Plan*, the organization's roadmap for responding to "new national security realities."³⁰ Space occupies a prominent place in an appendix listing programs and future systems concepts that the Air Force finds key to its transformation.³¹ Some nearly defy imagination. The Evolutionary Air and Space Global Laser Engagement (EAGLE) Airship Relay Mirrors system will employ space-based mirrors to project laser beams fired by terrestrial, airborne or space-based lasers at varying frequencies and powers. A Hypervelocity Rod Bundles ("Rods from God") system would launch rods of depleted uranium or tungsten weighing up to 100 kilos from space against terrestrial targets. The Space-based Radio Frequency Energy Weapon would consist of a constellation of satellites capable of transmitting radio frequencies against electronic targets such as a command and control system, with effects ranging from disruption to destruction. The final mission area, space support, is of *de minimus* relevance to this study as it poses few issues of international law. It encompasses the launch, deployment, maintenance, sustainment, and recovery of space craft.

Before turning to the law governing military space activities, it should be noted that commercial space systems provide extensive services to the military.³² For instance, foreign governments purchase between 40 and 80 per cent of the commercially available remote sensing high-resolution imagery.³³ Even the United States is increasingly turning to commercial operators to provide space services. During air operations against the Federal Republic of Yugoslavia in 1999, for instance, commercial satellites provided 60 per cent of satellite communications capability. This *de facto* reliance became policy the same year with the Department of Defense's "Space Policy". That document, still in effect as of May 2006, provided "[a]quisition of national security-unique systems shall not be authorized, in general, unless suitable and adaptable commercial alternatives are not available."³⁴

³⁰ United States Air Force, *Transformation Flight Plan*, 2003, at foreword.

³¹ *Ibid.* at app. D.

³² On this subject and its legal implications, see E. Waldrop, "Integration of Military and Civilian Space Assets: Legal and National Security Implications", *Air Force Law Review* 54 (2004), 157 et seq. (166-167).

³³ *Transformation* 2003, see note 30, 61.

³⁴ Department of Defense, *Space Policy*, DoD Directive 3100.10 of 9 July 1999, para 4.10.3.

III. Treaty Law Governing Operations in Space

Space law is unique, in great part because space exploration began a mere half-century ago with launch of the Soviet Union's Sputnik I in 1957.³⁵ Since then, space activities have not blossomed to the point where state practice has generated a robust body of customary international law. Rather, the accepted body of customary law principles regarding space is limited to the free use of space by all states, a prohibition on claims of sovereignty over space, free exploration of space, and, perhaps, the obligation to rescue astronauts in distress. Only these principles evidence the consensus, and absence of objection or contrary practice by "specially affected" states, necessary to imbue them with customary character.³⁶ Each principle is also contained in one of the space treaties to which all major space faring states are party. Thus, they are binding as matters of both customary law and *lex scripta*.

Before turning to the core treaties governing space, it is necessary to delineate the parameters of the area. In other words, where does airspace end and space begin? This question is crucial, for airspace is sovereign territory of the sub adjacent state.³⁷ That state may deny entry for any reason or no reason at all, and place any conditions it wishes on transit in or through its airspace. International law acknowledges very few exceptions to this principle.³⁸

Unfortunately, no express treaty law provision delineates the boundary of space. The United States armed forces have adopted a functional approach, defining space in terms of aerodynamic parameters: "terrestrial-based forces generally operate below an altitude of roughly 100 kilometers, whereas space-based forces operate above this

³⁵ For articles on military operations in space and international law, see, M. Bourbonnière, "Law of Armed Conflict (LOAC) and the Neutralisation of Satellites of Ius in Bello Satellites", *Journal of Conflict & Security Law* 9 (2004), 43 et seq.; R. Ramey, "Armed Conflict on the Final Frontier: The Law of War in Space", *Air Force Law Review* 48 (2000), 1 et seq.

³⁶ On the nature and sources of customary international humanitarian law, see J. Henckaerts, "Study on Customary International Humanitarian Law: A Contribution to the Understanding and Respect for the Rule of Law in Armed Conflict", *Int'l Rev. of the Red Cross* 87 (2005), 175 et seq.

³⁷ See, e.g., The United Nations Convention on the Law of the Sea, article 2.2, 10 December 1982, UNTS Vol. 1833 No. 31363 [hereinafter LOSC].

³⁸ One example is the right of transit passage through an international strait. LOSC, see note 37, article 38.

altitude where the effects of drag and lift are negligible.”³⁹ Similarly, the United Kingdom’s military notes that while views on the “precise vertical and horizontal extent of airspace” vary, “[f]or practical purposes, it can be said that the upper limit to a state’s rights in airspace is above the highest altitude at which an aircraft can fly and below the lowest possible perigee of an earth satellite in orbit. The result is that anything in orbit can safely be regarded as in outer space.”⁴⁰ Adopting a functional approach, one may say that space is the point above the earth where space objects can maintain some sort of orbit, whereas airspace is the area beneath space in which air-breathing engines can function.

Despite agreement over where space lies, the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), a committee of 67 states that deals with space law (except that involving military uses), has developed five core space law treaties.⁴¹ Together, they form the *corpus juris spatialis*. Each is discussed below, although the reader is cautioned that during an armed conflict, international agreements incompatible with a state of international armed conflict are generally suspended as between belligerents.⁴²

The 1967 *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies* (Outer Space Treaty) (hereinafter OST), with 98 States Parties and 27 Signatory States as of 1 January 2006, is the keystone treaty of space law.⁴³ The OST sets forth two of the customary princi-

³⁹ AFDD 2-2, see note 17, 1.

⁴⁰ UK Ministry of Defence, *The Manual of the Law of Armed Conflict*, 2004, para. 12.13.

⁴¹ COPUOS was created in 1958 as an *ad hoc* committee pursuant to A/RES/1348 (XIII) of 13 December 1958 (Questions of the Peaceful Uses of Outer Space). It was extended in 1959 for two more years and established as a permanent body by A/RES/1472 (XIV) of 12 December 1959 (International Co-Operation in the Peaceful Uses of Outer Space). By A/RES/1721 (XVI) of 20 December 1961 (International Co-Operation in the Peaceful Uses of Outer Space) the General Assembly decided to continue the membership of the committee.

⁴² This point is expressly made in AFDD 2-2, see note 17, 35. However, because of the complexity of the issue, the comment is added that “the Judge Advocate General’s Department should be consulted when considering counterspace and space force application operations to ensure compliance with domestic and international legal norms,” *ibid*.

⁴³ 18 U.S.T. 2410, UNTS Vol. 610 No. 8843. The treaty was based on three General Assembly Resolutions: International Co-operation in the Peaceful

ples cited above. Most significant from a military perspective is that codified in article I, which provides that space is “free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.”⁴⁴ It is this principle which legitimizes the use of satellites to perform communications, surveillance, and other functions without authorization from the sub adjacent state, even during peacetime. Article II of OST codifies the 2nd customary principle, that “outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.”⁴⁵

Several other provisions of the OST bear on military or military related activities in space, although the precise applicability of the treaty during an armed conflict would be determined on a case-by-case basis in light of such matters as whether those involved are opposing belligerents, the consistency of the particular provision with a state of armed conflict, and so forth. Among the most controversial is the treaty’s preambular language recognizing mankind’s interest in using space for “peaceful purposes.” A long-standing debate continues over the term “peaceful” (which also appears elsewhere in the agreement). Some commentators suggest that it should be interpreted as “non-military.” Most space-faring nations take the position that “peaceful” means “non-aggressive or non-hostile.” For instance, the United States asserts that:

“[u]nder National Space Policy ‘peaceful purposes’ allow defense and intelligence-related activities in pursuit of national security and other goals. Permitted is the use of offensive space forces, either in a counterspace or space-to-ground role, in national or collective self-defense under Article 51 of the United Nations Charter or when the use of force is authorized by the United Nations Security Council.”⁴⁶

Widespread state practice since the dawn of the space age supports the United States position. Today, space is used regularly for military

Uses of Outer Space, A/RES/1802 (XVII) of 14 December 1962; Declaration of Legal Principles Governing Activities of States in the Exploration and Use of Outer Space, A/RES/1962 (XVIII) of 13 December 1963; International Co-operation in the Peaceful Uses of Outer Space, A/RES/1963 (XVIII) of 13 December 1963.

⁴⁴ OST, see above, article I.

⁴⁵ *Ibid.*, article II.

⁴⁶ AFDD 2-2, see note 17, 35.

purposes ranging from intelligence imaging to communications, usually without protest. Even ill-equipped armed forces rely on such commercially available space-dependent products as mobile phones and GPS locators. In light of such state practice, the continuing insistence by some commentators that space is reserved for non-military purposes is curious. Additional support can be found in the fact that under the 1982 Law of the Sea Convention, the high seas are also “reserved for peaceful purposes.”⁴⁷ Obviously, given that most coastal nations have navies, and have had for millennia, any assertion that this provision banned military activities at sea would be absurd. Why the OST would be interpreted differently is unclear at best.

A related issue is space weaponization, a possibility envisaged with regard to both the counter space and space force application mission areas. The UN Conference on Disarmament has been addressing space weaponization for two decades and in the last 10 years the General Assembly has passed almost a dozen resolutions urging against an arms race in space.⁴⁸

In this regard, article III of the OST provides:

“States Parties to the Treaty shall carry on activities in the exploration and use of outer space, including the Moon and other celestial bodies, in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding.”

Note that the article prohibits only activities in violation of international law. It would not ban the use of weapons from or against space-based assets if the use in question was lawful under *jus ad bellum* exceptions to the use of force prohibition, such as action pursuant to Security Council mandate and self-defense, and otherwise comported with international humanitarian law.

Further, the OST obligations must be interpreted in light of the UN Charter because Charter obligations take precedence over obligations or rights contained in other treaties, even those that post-date the Charter.⁴⁹ Consider Article 41 of the Charter, by which the Security Council

⁴⁷ LOSC, see note 37, article 88.

⁴⁸ Available at the UN Office for Outer Space Affairs website: <www.oosa.unvienna.org/SpaceLaw/gares/index.html>.

⁴⁹ “In the event of a conflict between the obligations of the Members of the United Nations under the present Charter and their obligations under any

may authorize non-forceful measures to resolve threats to the peace, breaches of the peace, or acts of aggression. Such measures expressly include interruption of “radio, and other means of communications,” a function increasingly provided with the assistance of satellites. The Security Council may also, under Article 42, authorize forceful measures. Although the text mentions only “action by air, sea, or land forces,” it would make no sense to limit the Council’s authority to those areas, particularly since the Charter was drafted before the first space flight. Rather, the Security Council may authorize military action in space as on earth or in the atmosphere. Indeed, since Member States are obligated to accept and carry out decisions of the Security Council,⁵⁰ a state must comply with a decision of the Security Council even if it authorized action that would otherwise violate the OST. Thus, any use of force in space pursuant to a Security Council mandate would undeniably be lawful.

Finally, article III’s reference to “international peace and security” is significant in light of use of the same term in Article 1(1) of the Charter. As noted by Rüdiger Wolfrum, the reference to “security” in Article 1 constituted recognition of the legitimacy of “activity that is necessary for maintaining the conditions of peace.”⁵¹ The fact that peace can be maintained through “effective collective measures for the prevention and removal of threats to the peace, and for the suppression of acts of aggression or other breaches of peace” supports this interpretation.⁵²

Article IV of the OST contains two specific prohibitions on weaponization of space:

“States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds

other international agreement, their obligations under the present Charter shall prevail,” UN Charter, Article 103. The general principle that subsequent treaties on the same subject matter prevail over their predecessors (except where provided to the contrary in the later treaty) is subject of the Vienna Convention on the Law of Treaties, article 30, UNTS Vol. 1155 No. 18232.

⁵⁰ “The Members of the United Nations agree to accept and carry out the decisions of the Security Council in accordance with the present Charter.” UN Charter, Article 25.

⁵¹ R. Wolfrum, “Article 1”, in: B. Simma (ed.), *The Charter of the United Nations*, 2nd edition 2002, 39 et seq. (41).

⁵² UN Charter, Article 1(1).

of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner.

The Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military manoeuvres on celestial bodies shall be forbidden. The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited.”

Although the term *outer space* includes celestial bodies, when celestial bodies are referred to in the treaty, the norm in question does not extend to space generally.⁵³ It cannot be otherwise, for both the United States and Soviet Union had sent military satellites into orbit before the OST was negotiated.⁵⁴ Therefore, with the exception of weapons of mass destruction, article IV prohibits only military entities, weapons testing, and exercises on *celestial bodies*, including the moon. It does not prohibit placing conventional weapons or military space stations into orbit or space-based exercises or weapons testing.⁵⁵

Nor are the WMD restrictions all encompassing. Note, for example, that the OST does not prohibit firing intercontinental ballistic missiles or other WMD systems through space since they are not in orbit, based on a celestial body, or otherwise stationed in space. At least by the terms of the article, the OST would likewise not prohibit the use of WMD in space, although the issue of whether this is a fair interpreta-

⁵³ Reviewing the negotiating record of the treaty, Christol indicates the omission of “outer space” was intentional. C. Christol, *The Modern International Law of Outer Space*, 1982, 24.

⁵⁴ The US National Reconnaissance Office’s CORONA photo reconnaissance satellites began operation in 1960, three years later than the Soviets SPUTNIK I entered orbit.

⁵⁵ During the negotiations, both the United States and Soviet Union emphasized that omission of the term “outer space” from the second paragraph was an intentional rejection of an absolute ban on military activities in space; the limitations were restricted to celestial bodies. Treaty on Outer Space: Hearings before the Senate Committee on Foreign Relations, 90th Cong., 22, 59 (1967) (statement of the US Ambassador to the UN); Summary Record of the UN Committee on the Peaceful Uses of Outer Space (COPUOS), 1966 Doc. A/AC.105/C.2/SR.66, page 6 (statement of the Soviet Permanent Representative to the UN).

tion of the article is on-going.⁵⁶ The article speaks only of placement, thereby leaving open the option of launching weapons of mass destruction from earth against space or through space against terrestrial targets. Of course, other applicable law, such as international humanitarian law's principle of proportionality, would limit or bar use in certain circumstances.

If States Parties to the OST conduct military space activities, they must, pursuant to article IX, do so in a fashion that accommodates the interests and activities of other states. Specifically, states must act with "due regard to the corresponding interests of all other States Parties to the Treaty."⁵⁷ Moreover, a state that "has reason to believe that an activity or experiment planned by it or its nationals in outer space, including the Moon and other celestial bodies, would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space" must conduct "appropriate" prior consultations.⁵⁸ As an example, and assuming application of this treaty provision during armed conflict, a belligerent disadvantaged by a multinational consortium's satellite that generated both peaceful use imagery (e.g., weather) and imagery useful to an opposing belligerent (e.g., troop positions) would have to consult with states owning the satellite before acting to neutralize it. Once it had consulted in good faith, even if unsuccessful in negotiating an acceptable solution, it could take action, so long as that action was conducted with due regard to the activities of other states.

Because the OST fails to define the term *harmful interference*, states enjoy a degree of discretion in deciding whether their activities require prior consultation. Similarly, the *appropriateness* of a notification is case-specific. In particular, national security space activities often necessitate secrecy. The notification required in such cases would differ from, for instance, those required for purely commercial activities. The one obvious exception to the notification and consultation requirement would be interference with enemy space systems of military utility. Such systems constitute military objectives and may be attacked and destroyed. Additionally, they do not meet article IX's *peaceful* criterion.

⁵⁶ R. Lee, "The Jus ad Bellum in Spatialis: The Exact Content and Practical Implications of the Law on the Use of Force in Outer Space", *Journal of Space Law* 29 (2003), 93 et seq. (94).

⁵⁷ OST, see note 43, article IX.

⁵⁸ Ibid.

With regard to military activities in space, mention should be made of article VI:

“States Parties to the Treaty shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty. The activities of non-governmental entities in outer space, including the Moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the Treaty. When activities are carried on in outer space, including the Moon and other celestial bodies, by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization.”

This article amounts to a form of state responsibility unique to space law. States are always responsible for the actions of their governmental entities in space.⁵⁹ For instance, the United States shoulders legal responsibility for the actions of the US Strategic Command and its service components, as well as those of the National Aeronautical and Space Agency (NASA). In most cases they would also be responsible for the actions of governmental contractors or others acting under their direction.⁶⁰ By the OST, however, states bear responsibility for space activities carried out by private companies or individuals.

During international armed conflict, the article may affect application of neutrality law.⁶¹ It is well-established that a neutral state violates

⁵⁹ International Law Commission, Articles of State Responsibility, article 4.1: “The conduct of any State organ shall be considered an act of that State under international law, whether the organ exercises legislative, executive, judicial or any other functions, whatever position it holds in the organization of the State, and whatever its character as an organ of the central Government or of a territorial unit of the State.”

⁶⁰ *Ibid.* article 8: “The conduct of a person or group of persons shall be considered an act of a State under international law if the person or group of persons is in fact acting on the instructions of, or under the direction or control of, that State in carrying out the conduct.”

⁶¹ On neutrality generally, see US Navy, Marine Corp, Coast Guard, Commander’s Handbook on the Law of Naval Operations, NWP 1-14M, MCWP 5-2.1, COMDTPUB P5800.7, ch. 7, 1995, reprinted in its annotated version as Vol. 73 of the International Law Studies, US Naval War

its duty of “impartiality and abstention” by assisting a belligerent, for example through the provision of military supplies and equipment. Applied to space, non-neutral service could include, as an illustration, providing satellite imagery to one side of the conflict.

But under the law of neutrality, states need not put an end to private trade between its nationals (or companies incorporated or registered in the state) and any of the belligerents. Article VI arguably transmutes this established principle with regard to space activities because pursuant to its terms states bear express international responsibility for both governmental and non-governmental activities. This certainly applies to any activities they license or to which they otherwise officially consent.

The neutral state concerned would be obliged to take steps to terminate any “non-neutral” service by non-governmental entities. If it does not, the opposing belligerent acquires a right to do so itself, although it must first demand that the neutral comply with its duty to put an end to the non-neutral activities. Further, the aggrieved belligerent may take only the minimum (but sufficient) actions necessary. The classic historical example occurred during the 1991 Gulf War, when the United States pressured other space powers to deny the Iraqis satellite imagery. Eventually, the United States purchased all available imagery to keep it from them.⁶² Doing so went beyond the United States legal obligations, for there is self-evidently no duty to enrich those providing non-neutral service.

Communications satellites may represent an exception to this rule. By the terms of the 1907 *Hague Convention (V) Respecting the Rights and Duties of Neutral Powers and Persons in Case of War on Land*, “[a] neutral Power is not called upon to forbid or restrict the use on behalf of the belligerents of telegraph or telephone cables or wireless telegraphy apparatus belonging to it or to companies or private individuals” (article 8). When it does, it must apply the measures impartially.⁶³ If the provision represents customary international law, neutral states and private entities are required thereunder to make equivalent satellite service available to all belligerents on the same terms. This rule would extend to satellites owned and operated by international consortia, for individual states do not avoid responsibility by virtue of multinational ownership.

College, 1999; D. Willson, “An Army View of Neutrality in Space: Legal Options for Space Negation”, *Air Force Law Review* 50 (2001), 175 et seq.

⁶² G.W. Rinehart, “Toward Space War”, *High Frontier*, Winter 2005, 47, 48.

⁶³ Convention (V), arts 8-9, 18 October 1907, 36 Stat. 2310, 1 Bevans 654.

Albeit viewed as an expression of then-existing customary international law in 1907, Hague V's status as such today is debatable.⁶⁴ To complicate matters, the treaty, by title and preambular language, applies "in Case of War on Land." A separate *Hague Convention (XIII) concerning the Rights and Duties of Neutral Powers in Naval War*, addresses neutrality in the event of war at sea, thereby demonstrating that Hague V was intentionally limited by medium. Therefore, even if the treaty provision is customary, it is highly questionable whether space activities occurring would be covered. Of course, in the 21st century, the effect of the UN Charter on the law of neutrality must be considered. In the event the Security Council mandated enforcement actions against a particular state pursuant to Chapter VII of the Charter, Article 25 would obligate all Member States to refrain from providing it assistance.⁶⁵

The 1968 *Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space* (hereinafter Rescue Agreement)⁶⁶ with its 88 States Parties and 25 Signatory States (and 1 state which has accepted its rights and obligations) as of 1 January 2006, expands on the OST's requirements to assist astronauts in distress.⁶⁷ It imposes a number of obligations. Those that learn of an astronaut in distress must immediately notify the launching state and UN Secretary-General,⁶⁸ and the state in which they land must rescue them.⁶⁹ In a location over which no state exercises sovereignty, such as international waters, any state "in a position to do so" must effect the rescue,⁷⁰ a duty somewhat analogous to the law of the sea obligation to aid mariners in distress.⁷¹ Astronauts must be unconditionally returned upon rescue.⁷² Space objects are treated somewhat differently. The state

⁶⁴ See discussion in A. Roberts/ R. Guelff, *Documents on the Laws of War*, 2000, 85-87.

⁶⁵ The article obligates Member States to accept and carry out the decision of the Council; this obligation certainly extends to a prohibition on providing target states of an enforcement action assistance.

⁶⁶ UNTS Vol. 672 No. 9574, 19 U.S.T. 7570, T.I.A.S. No. 6599.

⁶⁷ OST, see note 43, article V.

⁶⁸ Rescue Agreement, see note 66, article 1. If the state cannot identify the astronaut or notify the launching state, it must make a public announcement.

⁶⁹ *Ibid.*, article 2.

⁷⁰ *Ibid.*, article 3.

⁷¹ LOSC, see note 37, article 98.

⁷² Rescue Agreement, see note 66, article 4.

within which they land must take whatever steps are “practicable” to recover space objects if the launching state so requests.⁷³

An armed conflict would suspend the Rescue Agreement as between belligerents.⁷⁴ They may capture or destroy the enemy’s space objects and target or capture astronauts qualifying as combatants. Captured combatant astronauts would be prisoners of war, held until the “cessation of active hostilities.”⁷⁵

The 1972 *Convention on International Liability for Damage Caused by Space Objects* (hereinafter Liability Convention)⁷⁶ has 83 States Parties and 25 Signatory States, and 3 states have accepted its rights and obligations as of 1 January 2006. It expands on the OST provisions regarding state responsibility.⁷⁷ The Liability Convention provides that launch states are absolutely liable for damages caused on earth or to aircraft in flight as a result of their space activities,⁷⁸ although not when the state suffering damage has itself acted with gross negligence or intent.⁷⁹ In outer space, liability only attaches in cases of negligence.⁸⁰

States may make claims on their own behalf or on behalf of nationals; a Claims Commission generally adjudicates those not settled within a year.⁸¹ There has been but one case invoking the convention. In 1978, a nuclear powered Soviet maritime surveillance satellite, Cosmos 954, fell from orbit into Canada, spreading radioactivity across a large area.

⁷³ Ibid., article 5.

⁷⁴ Although one space law expert has suggested that perhaps its operation would only be suspended *vis-à-vis* military space activities. It might remain applicable to civil space activities. M. Bourbonnière, “National Security Law in Outer Space: The Interface of Exploration and Security”, *Journal of Air Law and Commerce* 70 (2005), 3 et seq. (20).

⁷⁵ Geneva Convention (III) Relative to the Treatment of Prisoners of War, 12 August 1949, article 118; 6 U.S.T. 3316, 3320, UNTS Vol. 75 No. 972.

⁷⁶ 24 U.S.T. 2389, UNTS Vol. 961 No. 13810.

⁷⁷ OST, see note 43, arts VI and VII.

⁷⁸ Liability Convention, see note 76, article II. However, controversy exists over the operation of the provisions in practice. For instance, there is disagreement whether a state would be liable for an aviation accident resulting from flawed satellite generated navigational signals. See discussion Bourbonnière, see note 74, 23.

⁷⁹ Liability Convention, see note 76, article VI. For an argument that this provision anticipated the conduct of hostilities in space, see Ramey, see note 35, 135.

⁸⁰ Liability Convention, see note 76, article III.

⁸¹ Ibid., arts VIII, IX, XIV and XV.

Three years later, Canada and the Soviet Union signed a protocol by which the Soviet Union paid a three million dollar settlement, without acknowledging legal liability.⁸²

Some commentators have suggested that the absolute liability provision of the convention could require compensation for space-based attacks against ground or air-based targets.⁸³ Such assertions are misguided. Belligerents generally incur no liability for lawful attacks on military objectives; in other words, the convention's liability provisions are suspended as between belligerents.⁸⁴ Of course, belligerents are liable for damage caused in violation of international humanitarian law, a *lex specialis* principle articulated in article 3 of the 1907 Hague Convention (IV) respecting the Laws and Customs of War on Land.⁸⁵ The Convention is universally recognized as customary in nature.

The 1975 *Convention on the Registration of Objects Launched into Outer Space* (Registration Convention)⁸⁶ with 46 States Parties, 4 Signatory States and 2 states which have accepted its rights and obligations as of 1 January 2006, requires states to maintain a national registry of objects they launch into space. They must also notify the United Nations, as soon as practicable, of launch information.⁸⁷ Further, when one of its objects is returning from space, the launch state must provide notice "to the greatest extent feasible and as soon as practicable" when its objects return from space.⁸⁸ The *feasible* and *practicable* language provides

⁸² Canada-Union of Soviet Socialist Republics: Protocol on Settlement of Canada's Claim for Damages Caused by "Cosmos 954," *ILM* 20 (1981) 689 et seq. See also C. Christol, "International Liability for Damage Caused by Space Objects," *AJIL* 74 (1980), 346 et seq.

⁸³ Informal working paper by allied judge advocate, on file with author. See also Ramey, see note 35, 90.

⁸⁴ Supporting this position is an argument that the limits on liability expressly cited in the Liability Convention are merely illustrative. Other recognized international law bases for avoiding liability, such as consent, self-defense, counter-measures, force majeure, duress, and necessity, also apply. Bourbonnière, see note 74, 22.

⁸⁵ Convention (IV) respecting the Laws and Customs of War on Land, 18 October 1907, 36 Stat. 2295.

⁸⁶ 28 U.S.T. 695, UNTS Vol. 1023 No. 15020.

⁸⁷ The practice of registration commenced in 1961 with the establishment of the United Nations Registry of Launching, established pursuant to A/RES/1721 (XVI) B of 20 December 1961.

⁸⁸ Registration Convention, see note 86, article IV.

launch states with considerable discretion as to the timing and content of military launch notification.

The 1979 *Agreement on the Activities of States on the Moon and Other Celestial Bodies* (Moon Treaty)⁸⁹ is the final core space law treaty. Its most militarily significant provision is article 3:

“3.2: Any threat or use of force or any other hostile act or threat of hostile act on the Moon is prohibited. It is likewise prohibited to use the Moon in order to commit any such act or to engage in any such threat in relation to the Earth, the Moon, spacecraft [and] the personnel of spacecraft or man-made space-objects.

3.3: States Parties shall not place in orbit around, or other trajectory to or around the moon objects carrying nuclear weapons or any other kinds of weapons of mass destruction or place or use such weapons on or in the Moon.

3.4: The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers on the Moon [is prohibited].”

With 12 States Parties and 4 Signatory States as of 1 January 2006, it is of only limited influence on military space activities. Indeed, the sole space power that is Party to the instrument is France.

Several other treaties place assorted limits on military space operations. Of particular importance are treaty regimes bearing on nuclear weapons. The *Limited Test Ban Treaty* bans nuclear explosions in space.⁹⁰ That the prohibition is inapplicable to the use of nuclear weapons during armed conflict is apparent from its preambular language, which speaks of the “aim” (an aspirational norm) of the Parties and focuses in a substantive part on the testing of nuclear weapons.⁹¹ The related *Comprehensive Nuclear Test Ban Treaty* prohibits states from carrying “out any nuclear weapon test explosion, or any other nuclear explosion” and obliges them “to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control.” It is not in

⁸⁹ A/RES/34/68 of 5 December 1979.

⁹⁰ Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Underwater, 5 August 1963, article 1, 1963, 14 U.S.T. 1313, UNTS Vol. 480 No. 6964.

⁹¹ No mention is made of use, *ibid.*, preamble.

force and neither China nor the United States have ratified the agreement.⁹²

The *Strategic Arms Reduction Treaty (I)* between the United States and the Soviet Union forbids them from producing, testing, or deploying “systems, including missiles, for placing nuclear weapons or any other kind of weapons of mass destruction into Earth orbit or a fraction of an earth orbit.”⁹³ Moreover, interfering with National Technical Means of Verification is prohibited.⁹⁴ This later point is important, for by the terms of the agreement, space assets that only monitor nuclear forces of the other side cannot be targeted or otherwise disrupted. A number of bilateral agreements with Russia similarly mandate confidence-building measures. Examples include notification requirements and non-interference with early warning or arms-control verification assets.⁹⁵ Finally, in 2001 the United States withdrew from the 1972 *Anti-Ballistic Missile Treaty*, an important space-related move because

⁹² Comprehensive Nuclear Test Ban Treaty, 10 September 1996, article 1.1, *ILM* 35 (1996) 1439 et seq., draft text adopted by the UN General Assembly in A/RES/ 50/245 of 10 September 1996.

⁹³ Treaty on the Reduction and Limitation of Strategic Offensive Arms, 31 July 1991, article V.18, US-USSR, Senate Treaty Doc. No. 102-20 (1991).

⁹⁴ NTM are typically satellites, *ibid.* article IX.2.

⁹⁵ Examples of others include the Agreement on Measures to Improve the US-USSR Direct Communications Link, 30 September 1971, UNTS Vol. 806 No. 6839 (updated the Hotline Agreement of 1963, which since 1973 is conducted through satellite communications); Memorandum of Agreement between the Government of the United States and Government of the Russian Federation on the Establishment of a Joint Center for the Exchange of Data from Early Warning Systems and Notifications of Missile Launches, 4 June 2000; Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War and the Agreement Between the United States of America and the Union of Soviet Socialist Republics on the Prevention of Nuclear War, 30 September 1971, UNTS Vol. 807 No. 11509, and 22 June 1973, U.S.T. 1478 respectively, which requires notification by missile warning systems of a launch of unidentified objects or indications of interference with such systems, as well as launch of missiles passing beyond national boundaries; Agreement Between the Government of the United States of America and the Government of the Union of Soviet Socialist Republics on Notifications of Launches of Intercontinental Ballistic Missile and Submarine-Launched Ballistic Missile, 31 May 1988, *ILM* 27 (1988), 1200.

the treaty had prohibited, *inter alia*, developing, testing, or deploying space-based ABM systems or components.⁹⁶

The radio frequency spectrum, including frequencies used by space-based assets, is governed by the ITU.⁹⁷ The organization's responsibilities include, *inter alia*, assigning frequencies and geosynchronous belt orbital positions. Pursuant to article 45 of its Constitution, radio station operations may not cause harmful interference with other radio services or communications.⁹⁸ Article 48.1 provides that "members retain their entire freedom with regard to military radio installations." Despite the exemption, most states abide by ITU guidelines as a matter of policy when conducting their military operations.⁹⁹ The organization's constitution also cites the right of states to block or otherwise limit telecommunications transmissions that impact its national security or violate its laws. When it does so, the state must immediately notify the ITU of the measures it has taken, unless notification would affect its security.¹⁰⁰

In the past, some intergovernmental space organizations, such as the International Telecommunications Satellite Organization (INTELSAT) and multinational space corporations, such as the International Maritime Satellite Organization (INMARSAT) restricted military use of their systems.¹⁰¹ Now privatized, both organizations advertise the mili-

⁹⁶ See Statement of Press Secretary, Announcement of Withdrawal from ABM Treaty, 13 December 2001, available at <www.whitehouse.gov/news/releases/2001/12/20011213-2.html>.

⁹⁷ Constitution and Convention of the International Telecommunication Union, 22 December 1992, Senate Treaty Doc. No. 104-34 (1996).

⁹⁸ Unlike the Outer Space Treaty, the ITU Constitution (in an annex) defines harmful interference as: "interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with the radio Regulations." Annex, Definition of Certain Terms Used in this Constitution, the Convention and the Administrative Regulations of the International Telecommunication Union.

⁹⁹ For instance, the United States has adopted a "due regard" standard for its own. Department of Defense, Management and Use of the Radio Frequency Spectrum, DoD Directive 4650.1, 8 June 2004, para. 4.3.3.

¹⁰⁰ ITU Constitution, see note 97, article 34.

¹⁰¹ The INTELSAT Agreement provided it may be used for "specialized" telecommunications services, but excluded "military purposes" from this definition, Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT), 20 August 1971, article III, 23 U.S.T. 3813. The INMARSAT Agreement stated that the organization "shall act exclu-

tary applications of their systems. Profit seems to also have motivated the French, who, despite opposition to Operation Iraqi Freedom, did not restrict Coalition access to SPOT satellite imagery data.¹⁰²

IV. International Humanitarian Law

International humanitarian law applies wherever armed conflict occurs, except as otherwise specifically provided (e.g., an IHL treaty addressing naval warfare). With regard to military space activities during armed conflict, most IHL issues surround the conduct of hostilities. The foundation of the normative architecture governing how hostilities may occur consists of two treaties, the 1907 *Hague Convention (IV) respecting the Laws and Customs of War on Land* and the 1977 *Additional Protocol I to the 1949 Geneva Conventions*.¹⁰³

The International Court of Justice has characterized the Hague Convention's provisions as customary in nature, such that they "are to be observed by all States whether or not they have ratified the conventions that contain them, because they constitute intransgressible principles of international customary law."¹⁰⁴ Be that as it may, the treaty

sively for peaceful purposes," Convention on the International Maritime Satellite Organization (INMARSAT), 3 September 1976, article 3.3, 31 U.S.T. 1, UNTS Vol. 1143 No. 17948. Arguably, this does not exclude military use as long as that use is in accordance with international law, especially the UN Charter.

¹⁰² Waldrop, see note 32, 209-210.

¹⁰³ Regulations respecting the Laws and Customs of War on Land, Annex to Convention (IV) respecting the Laws and Customs of War on Land, 18 October 1907, 36 Stat. 2295; Protocol Additional to the Geneva Convention of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), 8 June 1977, UNTS Vol. 1125 No. 17512, *ILM* 16 (1977), 1391 et seq.

¹⁰⁴ *Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons*, ICJ Reports 1996, para. 79. In its 2004 opinion, *Legal Consequences of the Construction of a Wall in the Occupied Palestinian Territory*, the Court reiterated this view; *Advisory Opinion on Legal Consequences of the Construction of a Wall in the Occupied Palestinian Territory*, ICJ Reports 2004, para. 89. In 1945, the International Military Tribunal had declared that norms set forth in the Regulations annexed to Hague Convention IV "were recognized by all civilized nations and were regarded as being declaratory of the laws and customs of war;" International Military Tribunal, *Trial of*

governs only land warfare, as is evident from the instrument's title. Companion treaties addressed war at sea,¹⁰⁵ and war in the air was left almost completely unregulated. Thus, despite its centrality to IHL, Hague IV does not apply to armed conflict in space.

Additional Protocol I enjoys slightly more direct applicability to space conflict. The treaty's reach is set out in article 49.3, which provides that the provisions on general protection against effects of hostilities (including rules governing targeting) "apply to any land, air or sea warfare which may affect the civilian population, individual civilians or civilian objects on land. They further apply to all attacks from the sea or from the air against objectives on land but do not otherwise affect the rules of international law applicable in armed conflict at sea or in the air."

According to the Official ICRC Commentary, the provision limits applicability of the Protocol to attacks against land targets or those that would affect the civilian population on land.¹⁰⁶ It might be suggested that the Protocol is completely inapplicable to space warfare. After all, the space age was well underway by the time the Protocols were being negotiated and, had the drafters intended to address conflict in space, they could easily have done so (or at least raised the issue for debate).

The suggestion goes too far. No indication exists that the Protocol drafters intentionally excluded space from the *land, air or sea* phraseology. Rather, the most reasonable interpretation is that the Protocol encompasses space-based attacks against land targets. It would also extend

the Major War Criminals, 14 November 1945 – 1 October 1946, Nuremberg, 1947, Vol. 1, 254.

¹⁰⁵ Convention (VI) relating to the Status of Enemy Merchant Ships at the Outbreak of Hostilities; Convention (VII) relating to the Conversion of Merchant Ships into War-Ships; Convention (VIII) relative to the Laying of Automatic Submarine Contact Mines; Convention (IX) concerning Bombardment by Naval Forces in Time of War; Convention (X) for the Adaptation to Maritime Warfare of the Principles of the Geneva Convention; Convention (XI) relative to Certain Restrictions with regard to the Exercise of the Right of Capture in Naval War; Convention (XII) relative to the Creation of an International Prize Court; Convention (XIII) concerning the Rights and Duties of Neutral Powers in Naval War, all are dated 18 October 1907 and are available on the ICRC website at <www.icrc.org/ihl.nsf/WebFULL?OpenView>.

¹⁰⁶ Y. Sandoz/ C. Swinarski/ B. Zimmerman (eds), *Commentary on the Additional Protocols of 8 June 1977 to the Geneva Conventions of 12 August 1949*, 1987, paras 1892-1899.

to attacks against space-based assets (whatever the source) that would affect the civilian population (for instance, by interfering with emergency response communications).

Despite the paucity of directly applicable treaty law, customary IHL principles would serve to fill much of the *lex scripta* void *vis-à-vis* warfare to, through, and from space. Near universal concurrence exists that customary principles such as distinction apply regardless of the situs of battle. There is little reason to distinguish their extension to space warfare from applicability to other forms of combat (air-to-air, air-to-sea, sea-to-sea, and sea-to-air) for which there are few written norms.

As with land, sea, or air-based targets, those in space (or those attacked from space) must qualify as a military objective. Military objectives are “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.”¹⁰⁷

All military satellites are military objectives by virtue of the “nature” criterion. This is true even as to those that also serve civilian purposes, such as the GPS constellation. Civilian space-based assets qualify as military objectives pursuant to the “use” criterion if they serve military purposes (“dual-use”). Many do. Examples include commercial communications, navigation, remote-sensing, and weather satellites providing contracted services to the military. Of course, attacks against space-based assets qualifying under either criterion must comport with other aspects of IHL, most notably the principle of proportionality and the precautions in attack requirements discussed below.

The two remaining criteria are more difficult to apply with certainty in the space context. “Purpose” refers to the “intended future use of an object.”¹⁰⁸ Of course, it is often difficult to determine when the enemy intends to convert a civilian object to military use. Nevertheless, once the intention matures, the object becomes target able as a matter of law.

It is essential to emphasize that it is impermissible to attack a civilian object merely because of its potential value to the enemy. In the space context, for instance, destroying commercial satellites in the absence of reliable intelligence that the enemy intends to acquire their imagery for

¹⁰⁷ Protocol I, see note 103, article 52.2. See also J. Henckaerts/ L. Doswald-Beck, *Customary International Humanitarian Law Study*, 2005, at Rule 8 [hereinafter CIHLS].

¹⁰⁸ Commentary, see note 106, para. 2022.

military purposes would violate IHL. On the other hand, if a contract for future acquisition of the products has been executed, the purpose criterion will have been met. The dilemma with space systems lies in the fact that their product or function may be immediately of use to the armed forces without preparatory steps. Indeed, conversion to military use may involve nothing more than delivery of imagery to the armed forces or programming the satellite to handle military data. Thus, intent may not become discernable until the space object qualifies as a military objective through use.

By the last criterion, “location”, “objects which by their nature have no military function but which, by virtue of their location, make an effective contribution to military action” are military objectives.¹⁰⁹ The classic example is the mountain pass through which the enemy will attack. Perhaps the single-most distinguishing characteristic of space is its location; it represents the ultimate high ground from which the enemy may be observed and attacked. Thus, it constitutes a lucrative military objective by virtue of location. A belligerent wishing to deprive an enemy of its use might, for instance, place space debris into a particular orbit or cause an explosion at a specific point in space to deprive the enemy of use at a certain moment (e.g., when they want to secretly reposition forces). Although unlawful in peacetime as interfering with the free use of space, during conflict such actions might well be lawful under the more permissive IHL regime.

One caveat regarding combat operations involving space is that IHL only prohibits “attacks” against civilians and civilian objects. “Attacks” is a legal term of art defined as “acts of violence against the adversary, whether in offence or in defence.”¹¹⁰ It includes non-kinetic operations that cause damage or destruction to civilian objects or injury to, or death of, civilians. Operations directed against civilians or civilian objects which result in consequences short of this standard, such as inconvenience or non-injurious hardship, would not constitute an attack and, therefore, not be prohibited in IHL.¹¹¹ The classic example is psychological warfare, which has for centuries targeted the enemy’s population.

¹⁰⁹ Ibid., para. 2021.

¹¹⁰ Protocol I, see note 103, article 49.1

¹¹¹ For a discussion of this point, see M. Schmitt, “Wired Warfare: Computer Network Attack and International Law”, *Int’l Rev. of the Red Cross* 84 (2002), 365 et seq. (375-378).

This distinction is especially relevant in space warfare. For instance, operations directed against space sensors are likely to be non-kinetic because of, *inter alia*, the risks posed by space debris to civilian, neutral, or friendly assets in orbit. Moreover, at least in contemporary warfare, potential attackers possess greater capability to jam, block, distort, alter, or otherwise neutralize a space sensor's product or function than to physically damage or destroy the satellite. Indeed, with the advent of information warfare operations, particularly computer network attack, satellite operations have become especially vulnerable.¹¹² As long as the consequences, direct or indirect, of the operation in question do not reach the attack threshold, it will comport with the IHL principle of distinction.

Attacks must not only be limited to military objectives, they must comply with the proportionality principle. This principle prohibits "an attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated."¹¹³

With regard to attacks from space against terrestrial targets, there is no significant difference from those originating elsewhere. That said, the proportionality principle is of particular relevance to potential attacks into space. Many space systems are used for both civilian and military purposes. Such dual-use entities constitute legitimate military objectives, but, because they are used in part for civilian purposes, collateral damage to the civilian aspects of the system will likely result from an attack. This is the damage that will be assessed for excessiveness *vis-à-vis* the military advantage that the attacker anticipated gaining. On the other hand, the absence of civilian objects or civilians in

¹¹² Information operations are "[a]ctions taken to affect adversary information and information systems while defending one's own information and information systems." Information warfare consists of information operations conducted during time of crisis or conflict. Computer network attack consists of "[o]perations to disrupt, deny, degrade, or destroy information resident in computers and computer networks, or the computers and networks themselves;" DoD Dictionary, see note 22. On the subject, see M. Schmitt/ H. Harrison-Dinniss/ T. Winfield, "Computers and War: The Legal Battlespace", *Harvard Program on Humanitarian Policy and Conflict Research*, International Humanitarian Law Research Initiative Briefing Paper June 2004, available at <www.ihlresearch.org/ihl/pdfs/schmittetal.pdf>.

¹¹³ Protocol I, see note 103, arts 51.5 (b), 57.2 (a)(iii), and 57.2 (b). See also CIHLS, see note 107, ch. 4.

close proximity to potential targets means there is typically little risk of collateral damage to space objects other than the target itself, although there is some risk of causing space debris (or causing the targeted system to drift out of control) that may subsequently damage other systems in orbit.

The United States has considered the issue of collateral damage to civilian objects and incidental injury to civilians caused during space-related combat operations. In its Transformation Flight Plan, the Air Force adopted an incremental approach to negating enemy space capabilities, one expressly designed to minimize collateral damage and incidental injury.

The Joint Force Commander will generally approach these space negation options (deception, disruption, denial, degradation, destruction) in ascending order. The wide and increasing existence of multinational space system ventures (involving a host of state and non-state actors) creates the need to limit collateral damage to the greatest extent possible. Additionally, the Joint Force Commander must minimize hazards to navigation created by space debris that impacts all spacefaring activity. Finally, strategic deterrence is enhanced by both the ability to achieve precision effects (enhancing credibility) as well as providing the option to escalate conflict should an adversary take courses of action counter to United Nations vital interests.¹¹⁴

The reverse situation, where military space assets perform civilian services, presents similar proportionality issues. Operation of the GPS system by the USAF Space Command provides the ideal example.¹¹⁵ It is a system of extraordinary importance to the 21st century high-tech warrior, offering, as it does, everything from positional data used by Special Forces behind enemy lines to guidance for weapons such as the

¹¹⁴ Transformation Flight Plan 2004, see note 24, at D-22 – D-23.

¹¹⁵ Although operated by the Air Force, it is managed by the Interagency GPS Executive Board, which is chaired jointly by the Departments of Defense and Transportation. The system offers two levels of service, standard Positioning Service (SPS) and Precise Positioning Service (PPS). In May 2000, the United States decided not to exercise its ability to degrade the quality of the SPS signal through “selective availability;” White House Press Release, Statement by the President regarding the United States Decision to Stop Degrading Global Positioning System Accuracy, 1 May 2000, available at <www.navcen.uscg.gov/gps/selective_availability.htm>. Measures such as encryption are taken to ensure the integrity of, and access to, the PPS signal. The Europeans are developing their own navigational satellite system, “Galileo.”

JDAM. Yet, the civilian community is equally dependent on the system. GPS transmits navigational signals relied upon for activities as diverse as merchant shipping and avalanche rescue. There is absolutely no doubt that loss of the GPS signal would place civilian lives and property at great risk. Such consequences, even though resulting from an attack on a military objective, must be considered in the required proportionality analysis.

Somewhat more complicated is a situation involving a space asset owned and operated by a belligerent on which civilians (including foreign civilians) rely, but which is of value to the enemy. Again GPS is the archetypal example. Could the United States shut down aspects of the GPS system to deny an adversary use thereof if the impact on the civilian population would arguably be excessive to the resulting concrete and direct military advantage?

This is a very different question than that of the acceptability of the enemy's attack on the system. The answer lies in the term "attack," for the proportionality principle applies only to operations that qualify as such ("an *attack* which may be expected to ..."). A belligerent cannot attack its own systems as that term is understood in IHL. Additionally, there is no requirement in IHL to operate any system for the benefit of a civilian population, one's own or the enemy's.¹¹⁶ This general principle certainly extends to space-based assets.

To summarize, attacks may only be conducted against military objectives and they must comply with the principle of proportionality. A further IHL requirement is the taking of precautions to avoid mistaken attacks and to minimize collateral damage to civilian objects and incidental injury to civilians.¹¹⁷ One specific mandate is to "take all feasible precautions in the choice of means and methods of attack with a view to avoiding, and in any event to minimizing," harm to civilian and civilian objects.¹¹⁸ In strikes against space-based assets, the primary concern in this regard is, as suggested above, creation of space debris. As a result, an attacker might be required to employ a soft kill technique, such as computer network attack, in lieu of kinetic means if the former would

¹¹⁶ There is, of course, a duty not to "attack, destroy, remove or render useless objects indispensable to the survival of the civilian populations," but this provision is generally interpreted as intentionally denying basic subsistence items such as food, water, clothing, and shelter to the civilian population generally; Commentary, see note 106, paras 2098-2107.

¹¹⁷ Protocol I, see note 103, article 57. See also CIHLS, see note 107, ch. 5.

¹¹⁸ Protocol I, see note 103, article 57.2 (a)(ii).

result in less collateral damage while yielding a similar military advantage. Recall that the United States has adopted this approach in its space policy.

The precautions in attack obligations also include doing “everything feasible to verify that the objectives to be attacked are [not] ... civilian objects.”¹¹⁹ Of particular note in making possible compliance with this obligation is the Registration Convention, for it creates a degree of transparency as to the identity and nature of space-based objects.

To comply with the requisite precautionary duties, an attacker must carefully select targets. Specifically, “[w]hen a choice is possible between several military objectives for obtaining similar military advantage, the objective to be selected shall be that the attack on which may be expected to cause the least danger to civilian lives and to civilian objects.”¹²⁰ As an example, if a satellite can be reliably neutralized through a strike on a ground-based control node in a remote area, it would not be permissible to attack the satellite kinetically and thereby create dangerous space debris. Much like attacks against terrestrial targets, space warfare necessitates deconstructing space systems to make such determinations.

Beyond the general principles, a number of specific IHL provisions may reach certain space operations. For instance, under customary law, special protection is arguably extended to scientific entities. Many space activities would qualify as such.¹²¹ The environment also enjoys special protection under Additional Protocol I, which prohibits employment of “methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment.”¹²² For example, a nuclear explosion in space could result in severe damage to the ozone layer or changes to the ionosphere, with disastrous consequences on earth.

Perfidy is forbidden by both Additional Protocol I and customary law. “Acts inviting the confidence of an adversary to lead him to believe

¹¹⁹ Ibid., article 57.2 (a)(i).

¹²⁰ Ibid., article 57.3.

¹²¹ See, e.g., CIHLS, see note 107, Rule 38A, and accompanying discussion; Rome Statute of the International Criminal Court, 17 July 1998, article 8(2)(B)(ix), *ILM* 37 (1998), 1002 et seq.

¹²² Protocol I, see note 103, article 35.3. See the related provision at article 55.1. For a discussion of these articles, see M. Schmitt, “Green War: An Assessment of the Environmental Law of International Armed Conflict”, *Yale J. Int'l L.* 22 (1997), 1 et seq. See also CIHLS, see note 107, ch. 14.

that he is entitled to, or is obliged to accord, protection under the rules of international law applicable in armed conflict, with intent to betray that confidence” amount to perfidy.¹²³ The Additional Protocol characterizes feigning civilian status as perfidious. Although it might seem difficult to feign civilian status in space, recall the Registration Convention. Registration of a military satellite as civilian would constitute perfidy if the satellite was used to facilitate attacking the enemy by, for instance, providing data on the target’s location.¹²⁴

International law places limits on various forms of weaponry that might be employed into, from, or through space. Since the limits typically are not customary, they apply primarily to State Parties. “Military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party” are forbidden by the *Environmental Modification Convention*.¹²⁵ The Convention on Conventional Weapons’ Protocol IV on Blinding Laser Weapons, applied in the space warfare environment, bars State Parties from employing space-based laser specifically designed to cause permanent blindness.¹²⁶

A particularly topical subject in contemporary IHL analysis is direct participation by civilians in hostilities. It is a topic especially pertinent in the space context because military space commands employ huge numbers of civilians to conduct their operations. Further, civilian space companies provide services that the armed forces often rely on to conduct combat operations.

¹²³ Protocol I, see note 103, article 37.1. See also CIHLS, see note 107, ch. 18.

¹²⁴ An “Understanding Relating to Article II” sets forth a non-exhaustive list of phenomena that could be generated by environmental modification techniques. Included (in addition to earthquakes, tsunamis, changes in weather patterns, climate patterns, and ocean currents) are changes in the state of the ozone layer and changes in the state of the ionosphere; Report of the Conference of the Committee on Disarmament, Doc. A/31/27 (1976), GAOR, 31st Sess., Suppl. No. 27, 91, 92.

¹²⁵ The Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, 18 May 1977, article I.1, 31 U.S.T. 333, UNTS Vol. 1108 No. 17119. Environmental modification techniques include “any technique for changing – through the deliberate manipulation of natural processes – the dynamics, composition or structure of the Earth, including its biota, lithosphere, hydrosphere and atmosphere, or of outer space,” *ibid.*, article II.

¹²⁶ Protocol IV [to the Convention on Conventional Weapons] on Blinding Laser Weapons (Protocol IV), 13 October 1995, *ILM* 35 (1996), 1206 et seq.

Given the nature of military space operations, civilians who might be involved therein usually act far from the “field” of battle where there is only a slight risk of being captured by the enemy. Therefore, the controversies over prisoner of war and detainee status that have surfaced during recent conflicts are unlikely to surface with respect to space operations.¹²⁷ That said, a significant question is whether such civilians may be directly targeted. The expertise that is required to conduct space operations, and the difficulty of training and replacing space operators, makes them attractive targets.

Article 51.3 of Additional Protocol I provides that “civilians shall enjoy the protection afforded by this Section, unless and for such time as they take a direct part in hostilities.”¹²⁸ As the article appears in the section dealing with immunity of civilians from attack, the provision means that civilians who directly participate in hostilities may be attacked. Since they are directly targetable, civilians who are so participating do not count as incidentally injured civilians in the proportionality assessment.

The quandary lies in determining what types of actions constitute direct participation. According to the ICRC’s official *Commentary*, “[d]irect participation in hostilities implies a direct causal relationship between the activity engaged in and the harm done to the enemy at the

¹²⁷ The few in the vicinity of the battlefield would likely have been properly authorized to “accompany the armed forces,” thereby entitling them to prisoner of war status under Convention (III) relative to the Treatment of Prisoners of War, 12 August 1949, article 4A(4), 6 U.S.T. 3316, 3320, UNTS Vol. 75 No. 972. Moreover, in the unlikely event of capture, a civilian directly participating in space hostilities could not be punished as a war criminal for his or her actions. Although a detailed analysis is beyond the scope of this article, suffice it to say that the mere fact that a civilian directly participates in hostilities does not constitute a war crime. Absent commission of a separate war crime, a civilian directly participating may only be tried by a domestic tribunal enjoying personal and subject matter jurisdiction. On direct participation, see M.N. Schmitt, “Humanitarian Law and Direct Participation in Hostilities by Private Contractors or Civilian Employees”, *Chi. J. Int’l L.* 6 (2005), 511 et seq. On the topic, see also M. Schmitt, “Direct Participation in Hostilities and 21st Century Armed Conflict”, in: H. Fischer et al (eds), *Crisis Management and Humanitarian Protection*, 2004, 505.

¹²⁸ This provision is also customary in nature. See CIHLS, see note 107, Rule 6.

time and place where the activity takes place.”¹²⁹ It further describes direct participation as “acts which by their nature and purpose are intended to cause actual harm to the personnel and equipment of the armed forces.”¹³⁰

The application of these standards in practice is the source of much debate in the IHL community, so much that the International Committee of the Red Cross and the TMC Asser Institute are jointly sponsoring a multi-year project in an attempt to find common ground. In the author’s view, the best approach is to require the confluence of three factors: “but for” causation (the consequences would not have occurred but for the act), causal proximity to the foreseeable consequences of the act, and a *mens rea* of intent. Stated in narrative form,

“the civilian must have engaged in an action that he or she knew would harm (or otherwise disadvantage) the enemy in a relatively direct and immediate way. The participation must have been part of the process by which a particular use of force was rendered possible, either through preparation or execution. It is not necessary that the individual foresaw the eventual result of the operation, but only that he or she knew their participation was indispensable to a discrete hostile act or series of related acts.”¹³¹

Ultimately, it is the criticality of the act(s) in question to the direct application of violence against the enemy that determines its status as direct participation.

Using this standard, most space operations conducted by civilians do not constitute direct participation. Consider a civilian programming an imagery satellite. He or she has little idea as to what is being imaged and how the product will be used. The programmer may have no idea whatsoever that the imagery will be used to conduct attacks. Along the same lines, a civilian operating or maintaining the GPS system is not directly participating, even though he or she may realize modern weaponry often relies on GPS signals. The link between the activity and the application of force is too attenuated. Of course, direct participation in space hostilities may occur. For instance, a civilian operating a system that conducts offensive operations to, through, or from space would undeniably be directly participating.

¹²⁹ Commentary, see note 106, para. 1678.

¹³⁰ *Ibid.*, para. 1942.

¹³¹ Schmitt, *Humanitarian Law*, see note 127, 534.

V. Concluding Thought

Historically, military space operations have tended to be somewhat benign, thereby raising very few contentious legal issues. They have typically consisted of space control (passive defensive counter space missions), space support, and space force enhancement missions. Space warfare remains purely notional.

That will change. In future wars, it is inevitable that war will migrate to space. In particular, offensive and active defensive forms of space control, as well as space force application, are likely to become an increasingly prominent feature of conflict, especially as a growing number of states (and perhaps violent non-state actors) come to rely heavily on space assets to conduct terrestrial military operations. This reality will in-turn challenge the existing international legal architecture governing military operations in space, an architecture originally intended for space exploration and commercial exploitation. International humanitarian law, which was designed exclusively for terrestrial warfare, will also be sorely tested. The resiliency of the applicable law in the face of the challenges on the immediate horizon has yet to be determined.

