

FEATURES

Targeting in Outer Space: Legal Aspects of Operational Military Actions in Space

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Introduction

In the 2001, the Rumsfeld Commission released a report that stated that the United States needed to secure itself against a "Space Pearl Harbor."¹ This was in reaction to the U.S. military's increasing dependence on satellite technology. According to the report, such dependence could allow for adversaries to gain an asymmetric advantage over the United States by targeting its space assets during a conflict. A similar advantage could be gained by the United States by targeting the limited assets of smaller rivals during conflicts. Regardless of who is targeting whom it seems that the traditional arenas for warfare (land, sea, and air) may soon have a younger brother in space.²

These problems have been brought to the forefront in recent years since both China³ and the United States⁴ have demonstrated anti-satellite (ASAT) capabilities. While these incidents have been followed by attempts to ban weapons from space in the forms of draft treaties and codes of

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¹ Comm'n to Assess U.S. Nat'l Sec. Space Mgmt. & Org., REPORT OF THE COMMISSION TO ASSESS UNITED STATES NATIONAL SECURITY SPACE MANAGEMENT AND ORGANIZATION viii (2001), *available at* http://space.au.af.mil/space_commission/space20010111.pdf.

² *See generally* YORAM DINSTEIN, WAR AGGRESSION, AND SELF-DEFENSE 19-24 (4th ed. 2005).

³ *See generally* SHIRLEY KAN, CONG. RESEARCH SERV., RS 22652, CHINA'S ANTI-SATELLITE WEAPON TEST (2007), *available at* <http://www.fas.org/sgp/crs/row/RS22652.pdf>.

⁴ *See generally* USA-193: SELECTED DOCUMENTS (P.J. Blount & Joanne Irene Gabrynowicz eds., 2009), *available at* <http://www.spacelaw.olemiss.edu/resources/pdfs/usa193-selected-documents.pdf>.

conduct, no such legal instrument has yet to be adopted.⁵ These attempts are well intentioned disarmament initiatives; however, they may not be politically feasible in the near term. This does not mean that the use of weapons in space is necessarily an unbounded activity. Both space law and general international law (including International Humanitarian Law) place restrictions on the use of weapons in outer space.

This Article will address the legal issues involved with the targeting of space assets through analysis of problems that are specific to the space environment. Specifically, it will address issues such as discrimination of targets, the issues relating to satellites that are administered by international organizations or by a multiplicity of nations, and the problem of orbital debris.

I. The Concept of Space War

One of the underlying principles of space law is that space will be used for "peaceful purposes." This principle can be found in both the UN General Assembly resolution on the legal principles applicable to outer space⁶ and in the Outer Space Treaty.⁷ Furthermore, the principle has likely solidified as a part of customary international law. The state practice on the matter can be seen in its ubiquitous usage of the principle in statements, treaties, and policies of space faring nations.⁸

⁵ See, e.g., Draft Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force Against Outer Space Objects, in letter dated Feb. 12, 2008 from the Permanent Representative of the Russian Federation and the Permanent Representative of China to the Conference on Disarmament addressed to the Secretary-General of the conference, U.N. Doc. CD/1839 (Feb. 29, 2008) and Council of the European Union, *Council Conclusions concerning the revised draft Code of Conduct for Outer Space Activities*, Council Doc. 14455/10 (Oct. 11, 2010).

⁶ Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space, G.A. Res. 1962 (XVIII), U.N. Doc. A/RES/1962(XVIII) (Dec. 13, 1963).

⁷ Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205, *available at* <http://www.unoosa.org/pdf/publications/STSPACE11E.pdf> [hereinafter Outer Space Treaty].

⁸ See, e.g., THE WHITE HOUSE, NATIONAL SPACE POLICY OF THE UNITED STATES 3 (2010), *available at* http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf ("All nations have the right to explore and use space for peaceful purposes, and for the benefit of all humanity, in accordance with international law. Consistent with this principle, 'peaceful purposes' allows for space to be used for national and homeland

While it is relatively easy to say that "peaceful purposes" is an underlying principle of the law of Outer Space, it is much more difficult to define the content of that norm. It can be asserted that at a minimum, "peaceful purposes" can be read to mean non-aggressive and therefore equal to the prohibition on the use of force found under the UN Charter.⁹ While one can read the Outer Space Treaty and the associated body of space law to mean that conflicts are forbidden in space, it is incumbent to read any such measure in light of international law in general. Article III of the Outer Space Treaty incorporates international law and specifically the Charter of the United Nations into the space law regime.¹⁰ Furthermore, it quotes the UN Charter by declaring that the treaty's purpose is to promote "international peace and security."¹¹ This means that the Outer Space Treaty shares one of the main underlying principles of the UN Charter. The UN Charter bans the use of aggressive force, but allows for self-defense and Security Council-sanctioned use of force. Similarly, the Outer Space Treaty's ban on the aggressive use of force cannot be read to completely

security activities."); Statement by Hu Xiaodi, in U.N. GAOR, First Comm., 57th Sess., 12th mtg, at 4, U.N. Doc. A/C.1/57/PV.12 (Oct. 15, 2002) ("Using outer space for peaceful purposes reflects the common will and fundamental interests of the international community."); *Iran rocket launch non-military – ambassador*, RIA NOVOSTI, Feb. 8, 2008, <http://en.rian.ru/world/20080208/98732321.html> ("The recent launch of an Iranian research rocket was strictly for peaceful purposes, and was designed to obtain meteorological data, the Islamic republic's ambassador to Moscow said on Friday."); *Preparations for Launch of Experimental Communications Satellite in Full Gear*, KCNA, Feb. 24, 2009 in THE NORTH KOREAN EXPENDABLE CARRIER ROCKET, UNHA-2: SELECTED LEGAL DOCUMENTS 31 (2010), available at <http://www.spacelaw.olemiss.edu/resources/pdfs/north-korean-rocket.pdf> ("The DPRK has steadily pushed ahead with researches and development for putting satellites into orbit by its own efforts and technology since the 1980s, pursuant to its government's policy for the development of space and its peaceful use."); Unofficial Translation of the Government of Russian Federation Resolution of May 15, 1995, U.N. OFFICE FOR OUTER SPACE AFFAIRS, http://www.unoosa.org/oosa/SpaceLaw/national/russian_federation/resolution_468_1995E.html (last visited Nov. 20, 2011) ("The Russian Space Agency (RSA) is a federal body of executive power which ensures implementation of the state policy in the field of research and use of outer space for peaceful purposes . . .").

⁹ P. J. Blount, *Limits on Space Weapons: Incorporating the Law of War into the Corpus Juris Spatialis*, in PROCEEDINGS OF THE INTERNATIONAL INSTITUTE OF SPACE LAW 235, 236–38 (Corinne M. Contant Jorgenson ed., 2008).

¹⁰ Outer Space Treaty, *supra* note 7, art. III.

¹¹ *Id.*

preclude the use of force in space. In fact this is borne out by state practice, through the defensive stances that States take in relation to outer space.¹²

For this reason, it is essential that the rules of international armed conflict be extended into space. The International Court of Justice (ICJ) has made it clear that international humanitarian law applies to new technologies—the only question is how they apply.¹³ While Article III of the Outer Space Treaty does the leg work as far as making the rules applicable, one cannot simply take rules that were developed for the land, sea, and air environment and apply them to the space environment. This is due to the vastly different arena that space presents to the military. However, if one starts at one of the basic tenets of international humanitarian law—that parties to a conflict do not have unlimited means and methods of warfare—then one can begin to work out the contours of how armed conflict in space will be governed by law.¹⁴

II. Targeting in International Armed Conflict

The process of targeting is the process by which military officials choose objectives to attack in an armed conflict. For instance the U.S. Air Force defines targeting as:

The process through which objectives are selected for attack and desired effects are determined based upon a stated mission, force posture and capabilities, aerospace doctrine, plans, concepts of operations, and target intelligence.¹⁵

¹² For instance, the United States Space Policy recognizes a right “consistent with the inherent right of self-defense, [to] deter others from interference and attack, defend our space systems and contribute to the defense of allied space systems, and, if deterrence fails, defeat efforts to attack them.” THE WHITE HOUSE, *supra* note 8, at 3.

¹³ Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion, 1996 I.C.J. 226, ¶¶ 85–87 (July 8).

¹⁴ See THE HANDBOOK OF INTERNATIONAL HUMANITARIAN LAW 126 (Dieter Fleck ed., 2nd ed. 2008) [hereinafter Fleck]. See also San Remo Manual on International Law Applicable to Armed Conflicts at Sea, art 38, June 12, 1994, available at <http://www.icrc.org/IHL.nsf/52d68d14de6160e0c12563da005fdb1b/7694fe2016f347e1c125641f002d49ce!OpenDocument>; Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I) art. 35(1), June 8, 1977, 1125 U.N.T.S. 3 [hereinafter AP I]; Convention with Respect to the Laws and Customs of War on Land (Hague II), art. 22, July 29, 1899, 32 Stat. 1803, 1 Bevans 247.

¹⁵ U.S. AIR FORCE, USAF INTELLIGENCE TARGETING GUIDE 127 (1998).

The process is one that takes into account both pre-attack and post-attack considerations. Pre-attack considerations are those that concern whether the target is a legitimate military objective. Post attack considerations are those that consider the effects that an attack on the potential target will have on civilians, civilian objects, and the environment. The USAF definition is not limited to legal considerations, since targeting necessarily entails other considerations that the military must take into account when selecting and attacking.¹⁶ However, it should be noted that any selection is bounded by legal considerations, or in other words, the target selected must be a legal target and the effects that accrue from the attack must be legal as well, regardless of other considerations taken into account by the attack planner.¹⁷

Pre-attack legal considerations require that a planner of attacks verify that potential targets are legitimate military objective and not "civilians nor civilian objects."¹⁸ This is, as stated by the International Court of Justice, one of the "cardinal principles" of international humanitarian law.¹⁹ According to Additional Protocol I:

Attacks shall be limited strictly to military objectives. In so far as objects are concerned, military objectives are limited to those objects which by their nature, location, purpose or use make an effective contribution to military action and whose total or partial destruction, capture or neutralization, in the circumstances ruling at the time, offers a definite military advantage.²⁰

¹⁶ See generally MATTHEW C. WAXMAN, INTERNATIONAL LAW AND THE POLITICS OF URBAN AIR OPERATIONS chap. 3 (2000).

¹⁷ U.S. AIR FORCE, *supra* note 15, at 147 ("During planning, targeting personnel must contend with two external sources of restrictions on weapons and target selection. First, and most basic, are the constraints imposed by international law.")

¹⁸ WAXMAN, *supra* note 16, at 12.

¹⁹ Legality of the Threat or Use of Nuclear Weapons, *supra* note 13, at 78.

²⁰ AP I, *supra* note 14, art. 52.2. Although the United States is not a party to Additional Protocol I, it does view much of the Treaty as part of International Customary Law. In this particular context the United States views the first two paragraphs of article 52 as customary international law. See Memorandum for John H. McNeill, Assistant General Counsel (International) OSD (May 9, 1986) in THE UNITED STATES ARMY JUDGE ADVOCATE GENERAL'S LEGAL CENTER AND SCHOOL, LAW OF WAR DOCUMENTARY SUPPLEMENT 399, 399 (2007).

All objects that are not military objectives are considered to be civilian objects.²¹ It is therefore incumbent upon the planner to evaluate the nature, location, and use of an objective and to gauge whether that is making an effective contribution to military action.

Post attack legal considerations require that a planner determine whether an attack will be considered indiscriminate. The International Committee of the Red Cross states that indiscriminate attacks are:

- (a) those which are not directed at a specific military objective;
- (b) those which employ a method or means of combat which cannot be directed at a specific military objective; or
- (c) those which employ a method or means of combat the effects of which cannot be limited as required by international humanitarian law.²²

In each of these cases the attack must also be "of the nature to strike military objectives and civilians or civilian objects without distinction."²³ Planners must therefore choose targets that will not result in "a reckless disregard of the principle of distinction."²⁴ In other words attack planners cannot choose a target that would have the effect of causing an egregious loss of civilian life or property.

III. Verification of Targets

When targeting, the attack planner must verify that the potential target is a legitimate military objective and not a civilian object. This can be a difficult process in space. The nature of the space environment is such that it is nearly impossible to get a firsthand look at the satellites and other space objects in orbit. It is necessary then for a planner to gather information on potential targets from a variety of intelligence sources. These, however, may lead to an incomplete picture of exactly what is being targeted.

²¹ AP I, *supra* note 14, art. 52(1). The United States views this provision as customary international law. Memorandum for John H. McNeill, *supra* note 20, at 399.

²² INTERNATIONAL COMMITTEE OF THE RED CROSS, CUSTOMARY INTERNATIONAL HUMANITARIAN LAW Rule 12 (Jean-Marie Henckaerts & Louise Doswald-Beck 2005). *See also* AP I, *supra* note 14, art. 51(4).

²³ AP I, *supra* note 14, art. 51(4).

²⁴ YORAM DINSTEIN, THE CONDUCT OF HOSTILITIES UNDER THE LAW OF INTERNATIONAL ARMED CONFLICT 117 (2004).

A primary source of information on space objects is the United Nations Registry of Space Objects. The Registration Convention requires all nations who launch a space object to register these objects on national registers. In the case of two or more launching States, the States should determine between themselves which will register the object.²⁵ In turn, the convention requires the State of registry to register the space object on the United Nations register.²⁶ However, the Convention only requires a minimal amount of information:

- (a) Name of the launching State or States;
- (b) An appropriate designator of the space object or its registration number;
- (c) Date and territory or location of the launch;
- (d) Basic orbital parameters, including:
 - i. Nodal period;
 - ii. Inclination;
 - iii. Apogee;
 - iv. Perigee;
- (e) General function of the space object.²⁷

The limited nature of this information makes it difficult to use the UN register to determine what a space object does. The "[g]eneral function of the space object" was intentionally left broad by the drafters of the treaty so that space faring nations would feel at ease entering information onto the registry. However, these descriptions can be misleading. For instance, *USA-193* was a National Reconnaissance Office remote sensing satellite,²⁸ and the general function listed for it on the UN Registry states that it is a "[s]pacecraft engaged in practical applications and uses of space technology such as weather or communications."²⁹ In comparison, *Landsat 5*, a civil remote sensing satellite,³⁰ is also stated to be a "[s]pacecraft engaged in practical applications and uses of space technology such as weather or

²⁵ Convention on Registration of Objects Launched into Outer Space art. 2, *opened for signature* Jan. 14, 1975, 28 U.S.T. 695, 1023 U.N.T.S. 15 [hereinafter Registration Convention].

²⁶ *Id.* art. IV.

²⁷ *Id.*

²⁸ *UNOOSA Register of Space Objects: USA 193 (as of Jan. 14, 2009)* in USA-193: SELECTED DOCUMENTS, *supra* note 4, at 15.

²⁹ *See generally*, USA-193: SELECTED DOCUMENTS, *supra* note 4.

³⁰ *Landsat 5 History*, UNITED STATES GEOLOGICAL SERVICE, http://landsat.usgs.gov/about_landsat5.php (last visited Mar. 30, 2011).

communications."³¹ The registry does not disclose either the military or civil nature of the satellites registered. Additionally, not all satellites get registered. The UN Register lists 438 space objects that are not registered with the UN.³² One of these is a NATO satellite that would most likely have some sort of military use.³³

The planner can also turn to information found in the satellite tracking databases. These databases give orbital parameters for objects in orbit. However these parameters are only estimates and are not exact. For instance the recent collision of *Cosmos-2251* and *Iridium 33* was not avoided due to the fact that the estimated orbits were incorrect.³⁴ The satellite collision was not even in the top 150 close calls being monitored that day by Analytical Graphics, a commercial satellite tracking company.³⁵ A State's ability to know where a satellite is in orbit "depends on the type and number of sensors it has to observe the satellite and the software it has to calculate, based on its observations, the satellite's orbit and location at a future time."³⁶ It is also problematic for other nations that the most complete data sets are collected and distributed by the United States.³⁷

While states can bolster this information from other intelligence sources and open sources, it is still difficult to determine what is doing what in space. If, for example, a State knew that an adversary was using high resolution remote sensing imagery to determine troop locations and that that adversary had multiple remote sensing satellites, then there might be no possible way for the targeting state to determine which satellite was tasked with imaging its territory. This is very problematic when a State is presented with a variety of potential targets.

³¹ *Online Index of Objects Launched into Outer Space*, UNOOSA, <http://www.oosa.unvienna.org/oosa/search.do> (last visited Mar. 30, 2011).

³² *Id.* Many of these were launched before the Registration Convention existed, but the majority are from after that time period. *Id.*

³³ *Id.* See the entry for *NATO 3D* which has the international designator 1984-115A.

³⁴ Becky Iannotta, *Satellite Crash: Who's to Blame?*, SPACE.COM, Feb. 17, 2009, <http://www.space.com/4312-satellite-crash-blame.html>.

³⁵ *Id.*

³⁶ DAVID WRIGHT, ET AL., *THE PHYSICS OF SPACE SECURITY: A REFERENCE MANUAL* 160 (2005), available at http://www.amacad.org/publications/Physics_of_Space_Security.pdf.

³⁷ See generally T.S. Kelso, *Space Surveillance*, SATELLITE TIMES, Sept./Oct. 1997, <http://celestrak.com/columns/v04n01/>; *Space Surveillance*, AIR UNIVERSITY, <http://www.au.af.mil/au/awc/awcgate/usspc-fs/space.htm> (last visited Mar. 30, 2011).

IV. Types of Targets

Space assets come in a variety of flavors from the purely military to the purely commercial. For the purposes of defining targets, these assets can be seen as a spectrum. The planner of a given attack must be able to discern the issues that each potential target presents.

A. Military Satellites

Historically the "armed forces of the adversary" have served as the core of the category of legitimate military objectives.³⁸ Therefore it is logical that "equipment serving a navy or air force for combat purposes" is "valid as a military objective."³⁹ It follows that a military satellite is a legitimate military objective since it would be used for force enhancement in combat situations.⁴⁰ It could also be argued that military satellites are "objects for immediate combat service support," which also constitute legitimate military objectives.⁴¹ Satellites can be used to provide battlefield intelligence in the form of weather information or geospatial information, and they can facilitate advanced communications. In terrestrial, naval, or air warfare military objects that perform such services for troops would traditionally be considered legitimate military objectives; thus it makes sense that the same could be true of such objects in outer space. This principle is linked to the nature, purpose, and use of the object as required under IHL.

B. Civil Satellites

Governments often have civil satellites that are not run by the military. For instance the United States Geographical Survey (USGS) administers the *Landsat* satellite system. These satellites collect remote sensing data that is then distributed worldwide on a nondiscriminatory

³⁸ Fleck, *supra* note 14, at 181.

³⁹ *Id.* at 182.

⁴⁰ See, e.g., MICHAEL J. MUOLO, SPACE HANDBOOK: A WAR FIGHTER'S GUIDE TO SPACE VOLUME ONE 73 (Ricgard A. Hand et al eds., 1993) ("The Air Force views space as a medium, like the air or sea, in which to carry out different types of missions. Air Force doctrine specifically integrates space missions into the four basic roles performed by aerospace forces: force support, force enhancement, aerospace control, and force application.").

⁴¹ Fleck, *supra* note 14, at 182.

basis.⁴² The fact that a satellite is owned and operated by a government does not by default make the satellite a military objective. The Government's ownership does not mean that the "nature" of the satellite has become military. Nor does its purpose of imaging other States' territories make it a valid target. However, if the use of such a satellite becomes primarily military then it could be argued that the satellite could become a valid military target. For instance if the military was making extensive use of *Landsat* data and this data was being withheld from the rest of the world in a discriminatory way, then it is reasonable to assume that the use of the system has been altered in such a way that an adversary would be justified in attacking it. An analogy can be found in that of government buildings and offices in land warfare. These objectives are only legitimate objectives "when used in pursuance or support of military functions."⁴³

C. Commercial Satellites

Generally civilian objects cannot be made the target of an attack. However, international humanitarian law allows for "commercial objectives which make an effective contribution to military action" to become valid targets.⁴⁴ Civilian objects that are dedicated to civilian usages remain invalid targets "as long as they fulfill only their essential function."⁴⁵ It is important to note that the mere potential for an object to be used for a military purpose does not necessarily create a situation wherein that object becomes a valid military objective.⁴⁶ Instead the object must be actively "mak[ing] an effective contribution to military action."⁴⁷

For example, during an armed conflict a satellite radio company's (such as XM) assets could be effectively used for military communications. However, if that company is only supplying its customers with routine

⁴² Land Remote Sensing Policy Act, Pub. L. No. 102-555, § 2(10), 106 Stat. 4162, 4163 (1992) ("Regardless of management responsibilities for the Landsat program, the Nation's broad civilian, national security, commercial, and foreign policy interests in remote sensing will best be served by ensuring that Landsat remains an unclassified program that operates according to the principles of open skies and nondiscriminatory access.") (originally codified at 15 U.S.C. §5602(10), but since moved to 51 U.S.C. §60101 (historical and revision notes)).

⁴³ DINSTEIN, *supra* note 24, at 98.

⁴⁴ Fleck, *supra* note 14, at 181.

⁴⁵ DINSTEIN, *supra* note 24, at 90–91.

⁴⁶ *Id.* at 85–86.

⁴⁷ AP I, *supra* note 14, art. 52(2). The United States views this provision as customary international law. Memorandum for John H. McNeill, *supra* note 20, 399.

satellite radio services then the satellites may not become targets. This can be analogized to the classic example of whether a civilian TV station is a legitimate target.⁴⁸ Dinstein notes that the Committee Established to Review the NATO Bombing Campaign against the Federal Republic of Yugoslavia stated that attacks on TV and Radio stations "could be justified only if the TV and radio transmitters were integrated into the military command and control communications network."⁴⁹ That view can be contrasted with Hague Cultural Property Convention, which refers to "broadcasting stations" as important military objectives.⁵⁰ These two examples leave the question open. However, one can safely assert that when commercial telecommunications satellites begin to assist the military with command and control type functions they open themselves up as potential targets.

There are situations in which militaries become the customers of a satellite company, such as the one that occurred during the U.S. invasion of Afghanistan. During this operation the U.S. military exercised "shutter" control by becoming the sole customer for remote sensing images of the combat zone.⁵¹ While the motivation for such action was to keep such images out of the adversary's hands in order to protect U.S. troops, it is likely that these images were used to help military strategists in planning and execution of the ground operations. In this case it could be argued that the Geo-Eye satellites were making an "effective contribution to the military

⁴⁸ DINSTEIN, *supra* note 24, at 98.

⁴⁹ *Id.* (citing Final Report to the Prosecutor by the Committee Established to Review the NATO Bombing Campaign Against the Federal Republic of Yugoslavia, 39 ILM 1257, 1279 (2000)). The same committee noted that if the attack had been to battle propaganda from the station then the "legal status [of the attack] was considered more debatable." Fleck, *supra* note 14, at 183 (citing Final Report to the Prosecutor by the Committee Established to Review the NATO Bombing Campaign Against the Federal Republic of Yugoslavia, 39 ILM 1257, 1278 ¶¶ 75–76 (2000)).

⁵⁰ Convention for the Protection of Cultural Property in the Event of Armed Conflict art. 8(1)(a), May 14, 1954, 249 U.N.T.S. 240.

⁵¹ David Whitehouse, *US Buys Afghan Image Rights*, BBC, Oct. 17, 2001, <http://news.bbc.co.uk/2/hi/science/nature/1604426.stm>. It should be noted that the United States regulations on remote sensing satellites allows the government to exercise shutter control via the mechanism of buying exclusive rights to the data. 15 C.F.R. § 960.11(4) (2010) ("The licensee may be required by the Secretary to limit data collection and/or distribution by the system as determined to be necessary to meet significant national security or significant foreign policy concerns, or international obligations of the United States . . . During such limitations, the licensee shall, on request, provide unenhanced restricted images on a commercial basis exclusively to the U.S. Government . . .").

action" and would be a valid target. In fact, "[i]ntelligence-gathering centres related to the war effort (even when not run by the military establishment)" are considered targets.⁵²

A final problem presented by commercial satellites, is whether those registered to neutral parties to a conflict can become valid targets. For instance, if a belligerent is buying imagery from a third party and that party's satellite is registered to a neutral state, does the third party's satellite become a valid target. In this instance, the law of neutrality must be examined. "Neutral state[s] must not assist [parties] to the conflict";⁵³ this rule includes a duty for neutral states to "prohibit export and transit of war material by private persons for the benefit of one of the parties to the conflict."⁵⁴ However, current *opinion juris* considers war material to consist of weapons *strict sensu*.⁵⁵ It is doubtful then that remote sensing imagery provided by a commercial vendor would be considered a "war material." However, the reasoning behind this rule carries an analogy to space activities.

The traditional rule of neutrality allowed for private citizens to export armaments, but States began to recognize that "[t]he separation of the state and the private armaments industry is nowadays artificial and does not correspond with political reality."⁵⁶ An extension of this means that "[t]o the extent that arms export is subject to control by the state, the permission of such export is to be considered as a non-neutral service."⁵⁷ In a similar way space activities of commercial actors are not necessarily separated from the State. Article VI of the Outer Space Treaty, requires States to execute "continuing supervision" over the national activities of non-State actors.⁵⁸ This continuing supervision is usually manifested in a licensing scheme by the State.⁵⁹ Furthermore, Article VIII grants "jurisdiction and control" over a satellite to the registering State, this jurisdiction and control creates a

⁵² DINSTEIN, *supra* note 24, at 89.

⁵³ Fleck, *supra* note 14, at 584.

⁵⁴ *Id.* at 585.

⁵⁵ *Id.* at 586 ("i.e. material which is capable of being used for killing enemy soldiers or destroying enemy goods.").

⁵⁶ *Id.* at 585.

⁵⁷ *Id.*

⁵⁸ Outer Space Treaty, *supra* note 7, art. VI.

⁵⁹ See JULIAN HERMIDA, LEGAL BASIS FOR A NATIONAL SPACE LEGISLATION chap. II (2004) (examination of "Implementation of the Authorization and Supervision Principle" for most listed States show that some version of a licensing regime is used).

further connection between the neutral State and the activities taking place on a satellite. It can be argued that there is a fundamental connection between a State and the activities of the satellite for which it has jurisdiction and/or supervisory duties. The fact that State responsibility attaches to at least some actions of non-State actors taking part in space activities is compelling evidence that a State is just as involved with space activities as it would be with arms exports.⁶⁰ Therefore, the commercial satellite may become a legitimate military objective by virtue of the fact that non-neutral activities are occurring from onboard.

Of course, this view is not absolute. The State only has a duty to continually supervise to the extent that the activities taking place on the satellite are national ones.⁶¹ Also, international norms could bear on this situation, such as the principle of nondiscriminatory access embodied in UN General Assembly Resolution on Principles Relating to Remote Sensing of the Earth from Outer Space.⁶² Or the principle that neutral States need not prohibit belligerents from using telecommunications "apparatus belonging to it or companies or to private individuals"⁶³ or engaging in private commercial transactions with its citizens.⁶⁴ It is possible that navigation and communications provided by a neutral State's commercial satellites would not constitute a breach of neutrality, but that remote sensing of an adversary's troop positions would constitute a breach and make the satellite a legitimate target.

D. Satellites Run by International Organizations

Numerous satellites are operated by international organizations or by a multiplicity of states. The classic example being *Intelsat*, which started as a "user-owned cooperative to which national governments became a party."⁶⁵ Under this framework, once a State became a party to the *Intelsat* treaty, "its government . . . designated an operating organization to invest in the satellite system."⁶⁶ These sorts of systems, with a multiplicity of actors

⁶⁰ Outer Space Treaty, *supra* note 7, art. VI.

⁶¹ *Id.*

⁶² Principles Relating to Remote Sensing of the Earth from Outer Space art. XII, G.A. Res. 41/65, U.N. GAOR, 41st Sess., 95th plen. mtg., U.N. Doc. A/Res/41/65 (Dec. 3, 1986).

⁶³ Convention Respecting the Rights and Duties of Neutral Powers and Persons in Case of War on Land (Hague V) art. 8, Oct. 18, 1907, 36 Stat 2310, T.S. No. 540.

⁶⁴ David L. Willson, *An Army View of Neutrality in Space*, 50 A.F.L. REV. 195 (2001).

⁶⁵ ROGER COCHETTI, MOBILE SATELLITE COMMUNICATIONS HANDBOOK 9 (1995).

⁶⁶ *Id.*

and a quasi State-commercial framework, hold numerous problems for the legal advisor to an attack planner.

In Operation Desert Storm space assets were used to such an extent that it has been referred to as the first space war⁶⁷ and "a watershed event for the advancement of space information to the war-fighting personnel."⁶⁸ One of the specific uses of space assets was communications, and during the operation the U.S. military supplemented its communications capabilities by buying bandwidth on *Inmarsat* satellites.⁶⁹ *Inmarsat* is a telecommunications satellite system that was originally set up as an international organization with the purpose of "provid[ing] satellite-based, commercial communications services to ships, aircraft, and other mobile users."⁷⁰ In 1999, *Inmarsat* became the "first intergovernmental organisation to transform into a private company," and it is publicly traded on the London stock exchange.⁷¹ While *Inmarsat* has a commercial character, it is still overseen by an international organization, the International Mobile Satellite Organization (IMSO), which retains a "'special share' in *Inmarsat Ltd* which provides a mechanism to ensure that any commercial decisions taken are not detrimental to the public services."⁷² This organization currently has 95 member states.⁷³ The governing treaty for IMSO states that States shall "act exclusively for peaceful purposes"

⁶⁷ Gordon D. Issler, *Space Warfare Meets Information Warfare*, JOINT FORCES QUARTERLY, Autumn 2000, at 100. Issler does take issue with this notion claiming instead that "[b]ecause the ability of the United States to operate in space was not challenged, there was no battle for space superiority. However there was a contest for information superiority." *Id.*

⁶⁸ MUOLO, *supra* note 40, at 47.

⁶⁹ U.S. Army Space Division, Army Space Reference Text 7–20, *available at* http://www.fas.org/spp/military/docops/army/ref_text/index.html#CH7SEC2 ("During Operation DESERT STORM there were more than 150 small INMARSAT terminals in use by the US and coalition military forces, the CNN news team in Baghdad, Kuwaiti resistance fighters, and others. INMARSAT terminals provide connectivity and compatibility between each of the U.S. military services, its allies and other agencies equipped with an INMARSAT terminal. INMARSAT terminals were also used successfully in Somalia.").

⁷⁰ COCHETTI, *supra* note 65, at 69.

⁷¹ *About Inmarsat*, INMARSAT, <http://www.inmarsat.com/About/?language=EN&textonly=False> (last visited Nov. 9, 2011).

⁷² *What is IMSO?*, IMSO, http://www.imso.org/whatisimso_UK.asp (last visited Nov. 9, 2011).

⁷³ *List of Parties To The Convention On The International Mobile Satellite Organization*, IMSO, http://www.imso.org/member_states.asp (last visited Nov. 9, 2011).

while carrying out the purposes of the treaty.⁷⁴ However, the structure of Inmarsat is such that almost any entity can use its services including terrorist organizations,⁷⁵ and Inmarsat itself markets its services to the defense organizations.⁷⁶

While there is strong support for the concept that that these services do not violate the peaceful purposes principle found in international law, these actions may still "make an effective contribution to military action."⁷⁷ One must then question whether a satellite's multinational nature would have an effect on its status as a legitimate military objective. Inmarsat is a public private partnership, but it is substantially controlled by an international organization. The multinational character becomes more complex when it is taken into account that member States of a multinational organization may also be neutral states. In the case of Inmarsat, it can be presumed that since both the United States and Iraq are State parties of the IMSO that the military use of Inmarsat did not violate the treaty and the destruction of an Inmarsat satellite by either party would have violated the IMSO agreement's peaceful purposes provisions. There is, though, the potential for a situation in which at least one belligerent is not a party to such an agreement. In this situation it seems that there would be a political outcry over the destruction of such a satellite, but it is unclear as to whether the destruction would be illegal.⁷⁸

E. Human Space Stations

Another potential target in space would be that of a space station containing humans. The problems here stem from the *status mixtus* (i.e. they may fall into two different legal classifications at the same time) that astronauts aboard a space station may have. Traditionally, under international space law astronauts are considered the "envoys of

⁷⁴ Convention on The International Mobile Satellite Organization art. 3(a), Sept. 3, 1976, <http://www.imso.org/pdfs/Public/Basic%20Documents/Convention/P%20-%20IMSO%20CONVENTION%20-%20ENGLISH.pdf>.

⁷⁵ For example Osama Bin Laden had an InMarsat phone. See Duncan Campbell, *How the Plotters Slipped US Net*, THE GUARDIAN, SEPT. 27, 2011, <http://www.guardian.co.uk/technology/2001/sep/27/onlinesupplement.afghanistan>.

⁷⁶ See *Services for Defense*, INMARSAT (Sept. 2009), http://www.inmarsat.com/Downloads/English/Government/Govt_Services_for_defence_EN.pdf?language=EN&textonly=False.

⁷⁷ AP I, *supra* note 14, art. 52(2), 1125 U.N.T.S. at 27.

⁷⁸ Such an attack might allow other States to enter into hostilities.

mankind.⁷⁹ States are required to render assistance to and to return to the launching State astronauts that land in distress either in the territory of that state or on the high seas.⁸⁰ Some authors have argued that the classification of “envoys of mankind” gives astronauts diplomatic immunity,⁸¹ however such an interpretation is not borne out by the plain meaning of the text of the Outer Space Treaty.⁸² It would seem reasonable that the outbreak of conflict could constitute a “fundamental change in circumstances,” which could allow for an astronaut to change from the status of an envoy of mankind to that of a combatant.⁸³

Astronaut corps are often made up of military personnel even in civil space programs.⁸⁴ International humanitarian law allows for the targeting of “all members of the armed forces, whether or not they are actually engaged in combat.”⁸⁵ Thus the question must be asked whether military personnel are afforded a special protection when participating as astronauts. Such distinction will most likely have to be made on a case by case basis. For instance, if the personnel are actively engaged in military activities supporting combat operations⁸⁶ any immunity given by the Outer Space

⁷⁹ Outer Space Treaty, *supra* note 7, art. V, 18 U.S.T. at 2414, 610 U.N.T.S. at 208.

⁸⁰ Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space arts. 2-4, *opened for signature* Apr. 22, 1968, 19 U.S.T. 7570, 672 U.N.T.S. 119 [hereinafter Rescue and Return Agreement].

⁸¹ See Robert A. Ramey, *Armed Conflict on the Final Frontier: The Law of War in Space*, 48 A.F.L. Rev. 1, 150-53 (2000).

⁸² See Vienna Convention on the Law of Treaties art. 31, May 23, 1969, 1155 U.N.T.S. 331 [hereinafter Vienna Convention].

⁸³ *Id.* art. 62, 1155 U.N.T.S. at 347. *But see* LaToya Tate, *The Status of the Outer Space Treaty at International Law During “War” and “Those Measures Short of War,”* 32 J. Space L. 177, 192-93 (2006).

⁸⁴ NASA states that of its 94 Mission Specialists 32 are military. NASA, *Astronaut Selection: Frequently Asked Questions*,

<http://nasajobs.nasa.gov/astronauts/content/faq.htm> (last visited May 16, 2011), *archived at*

<http://web.archive.org/web/20101024135556/http://nasajobs.nasa.gov/astronauts/content/faq.htm> (last visited Jan. 26, 2012) (Internet archive from Oct. 24, 2010, as the information has since been removed from the site).

⁸⁵ DINSTEIN, *supra* note 24, at 94.

⁸⁶ There are few if any examples of such behavior. A weak one might be when a Russian cosmonaut photographed the area of conflict when Russia was engaged in armed conflict with Georgia in 2008. Frank Moring, Jr., *Cosmonaut Photographed South Ossetia From ISS*, AVIATION WEEK, Aug. 22, 2008,

http://www.aviationweek.com/aw/generic/story_channel.jsp?channel=space&id=news/OSS08228.xml. However, Russia claimed that these photographs were used for humanitarian assistance. *Id.*

Treaty may be lost since such activities would be in conflict with the rules of diplomatic immunity.⁸⁷ It might also be relevant whether there are civilian astronauts on board the station with the military astronaut; if so, the collateral damage caused by targeting the military astronaut may be too great to allow the attack.⁸⁸ It should be noted that if these civil personnel are also participating in the warfighting effort then they expose themselves to the risk of being targeted.⁸⁹

The tough fact pattern is the military astronaut who is not taking part in hostilities. While political and strategic considerations would not make this individual a likely target,⁹⁰ the question remains as to whether the individual would be a legal target. If diplomatic immunity is granted as part of the envoy of mankind status then this question may turn on the status of the Outer Space Treaty between the two parties during the conflict. One argument is that the Outer Space Treaty is a law making treaty and therefore it remains in force, making the military astronaut an illegal target.⁹¹ However, it could also be argued that a "fundamental change in circumstance" has taken place between the two parties and that the recognition of envoy status is no longer in force between the two. This would be similar to politicians (and in particular the head of state that serves as a commander in chief) who also serve in the military.⁹² Fortunately, such a situation as this seems far removed, but it should be noted that military

⁸⁷ The Vienna Convention on Diplomatic Relations states that a "receiving State must, even in case of armed conflict, grant facilities in order to enable persons enjoying privileges and immunities . . . to leave at the earliest possible moment." The Vienna Convention on Diplomatic Relations art. 44, Apr. 18, 1961, 23 U.S.T. 3277, 500 U.N.T.S. 95. Diplomatic immunity is a function of diplomatic relations, which only take place "by mutual consent." *Id.* art. 2. It stands to reason that if diplomatic immunity does exist for astronauts it ceases at the outbreak of hostilities and the breakdown of diplomatic relations. Since the astronaut would not be in the territory of the receiving state then there would be no further duties owed to the sending state in relation to that immunity.

⁸⁸ DINSTEIN, *supra* note 24, at 120 ("The principle of proportionality . . . [disallows] attacks against impeccable military objectives owing to anticipated disproportionate injury and damage to civilians or civilian objects.").

⁸⁹ *Id.* at 129.

⁹⁰ See generally MATTHEW C. WAXMAN, *supra* note 16, at chap. 3.

⁹¹ Tate, *supra* note 83, at 193.

⁹² Heads of State generally are not targets by virtue of their political position, however those that serve as the commander in chief are valid targets in armed conflict. DINSTEIN, *supra* note 24, at 99.

uses of space stations have been contemplated,⁹³ and that new nations are looking to enter this part of space exploration.⁹⁴

V. The Physics of Space and Indiscriminate Attacks

One of the most important limiting factors for the strategic uses of space is the physics of space. When an object is destroyed in space its fragments can remain orbiting the Earth as space debris. Space debris is "all man made objects including fragments and elements thereof, in Earth orbit or re-entering the atmosphere, that are non functional."⁹⁵ All objects in space orbit at a very high velocity; for this reason, space debris poses a threat to other objects.⁹⁶ There are currently 19,000 tracked items of space debris over 10 cm, and untracked debris under 10 cm is probably in the tens of millions.⁹⁷ An example of how the destruction of a space object can affect the amount of space debris can be found in the Chinese destruction of FY-1C. This ASAT test resulted in the creation of 2317 pieces of tracked debris making China "responsible for nearly half of all known and tracked satellite breakup debris currently in Earth orbit."⁹⁸ Strategically, militaries that are reliant on space assets understand the risk that debris pose to these assets and would most likely avoid an attack that destroyed a space object in orbit. However, a lesser military power looking to take advantage of a space power's reliance on space assets could see such an attack as a very inviting.⁹⁹

⁹³ See generally Christopher M. Petras, "Space Force Alpha": Military Use of the International Space Station and the Concept of "Peaceful Purposes," 53 A.F.L. REV. 135 (2002).

⁹⁴ China is the most recent State to enter the human space flight club.

⁹⁵ IADC-02-01: IADC Space Debris Mitigation Guidelines 3.1, (Inter-agency Space Debris Coordination Comm., 2002) (revised 2007), available at http://www.iadc-online.org/index.cgi?item=docs_pub.

⁹⁶ FAQ, NASA ORBITAL DEBRIS PROGRAM OFFICE, <http://orbitaldebris.jsc.nasa.gov/faqs.html> (last visited Jan. 3, 2012) ("In low Earth orbit (below 2,000 km), orbital debris circle the Earth at speeds of 7 to 8 km/s. However, the average impact speed of orbital debris with another space object will be approximately 10 km/s. Consequently, collisions with even a small piece of debris will involve considerable energy.").

⁹⁷ *Id.*

⁹⁸ NASA, *Fengyun-1C Debris: One Year Later*, ORBITAL DEBRIS Q. NEWS, Jan. 2008, at 3, <http://orbitaldebris.jsc.nasa.gov/newsletter/pdfs/ODQNv12i1.pdf>.

⁹⁹ Charles D. Lutes, *Spacepower in the 21st Century*, JOINT FORCE Q., Second Quarter 2008, at 55, <http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA518749> ("[A spoiler] would seek to employ asymmetric power, such as [an ASAT capability], to take advantage of this vulnerability. These spoilers are most likely to arise in reaction to a power employing a space domination or protection strategy.").

However, the physics of space may actually create a legal limitation to the destruction of space objects.

It is incumbent on the planner of an attack to be sure that the effects of the attack will not be indiscriminate.¹⁰⁰ Indiscriminate attacks include attacks that "employ a method or means of combat the effects of which cannot be limited as required by" international law.¹⁰¹ An attack on a destructive attack on a space object may violate this principle due to the potential debris cloud.

As already stated, a kinetic attack that destroys a satellite on orbit can create a large cloud of debris. The method and means of such an attack cannot be limited as required by international law. The first problem is that such an attack could put civilian objects at risk due to the number of commercial satellites in orbit. This is especially so in light of the fact that not all impacts can be accurately predicted, as in the case of *Cosmos-2251* and *Iridium-33* discussed in Part III. The risk of impact with the remains of the destroyed satellite by a civilian object would create a situation that could constitute an indiscriminate attack. An imperfect analogy can be made to the rules regarding sea mines and torpedoes. These means of warfare are limited in their use due to the risk that they pose to civilian objects. The specific risk is that a civilian object may collide with a mine or torpedo, thus detonating it. To ensure that this does not happen States are required to ensure that these instruments deactivate after a certain amount of time.¹⁰² In a similar manner, fragmentation debris poses a risk to civilian objects that must cross its path. If a commercial satellite collided with space debris resulting from an attack by a belligerent, then it could be argued that the damage was the result of an attack that was not limited in accordance with the laws of armed conflict. Of course, adhering to this rule may create an absurd result, in that the destruction of a commercial satellite by space debris caused by ASAT activity when not during an armed conflict would not be prohibited. However, such damage is covered by international law in

¹⁰⁰ AP I, *supra* note 14, Art. 51(4) ("Indiscriminate attacks are prohibited.").

¹⁰¹ INTERNATIONAL COMMITTEE OF THE RED CROSS, *supra* note 22, Rule 12.

¹⁰² SAN REMO MANUAL ON INTERNATIONAL LAW APPLICABLE TO ARMED CONFLICTS AT SEA ¶¶ 79, 82 (1994), *available at* <http://www.icrc.org/IHL.nsf/52d68d14de6160e0c12563da005fdb1b/7694fe2016f347e1c125641f002d49ce!OpenDocument>.

a variety of instruments and doctrines and is therefore not problematic from the perspective of the law of armed conflict.¹⁰³

Furthermore, an attack causing a wide debris field could violate the principle that an attack must not create long term, widespread and severe damage to the environment. Environmental considerations must be taken into account "when assessing what is necessary and proportionate in the pursuit of legitimate military objectives."¹⁰⁴ Additional Protocol I states that "[i]t is prohibited to employ methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment."¹⁰⁵ For the purposes of Additional Protocol I, widespread "may well be less than several hundred square kilometers" and long-term is measured in decades.¹⁰⁶ Orbital debris can certainly be considered to cause both long term and widespread damage to the space environment. Space debris in low earth orbit can remain orbiting the entire circumference of the globe for years to decades.¹⁰⁷ This inhibits all parties from using that particular orbit. However, there could be some

¹⁰³ Convention on International Liability for Damage Caused by Space Objects art. II-III, *opened for signature* Mar. 29 1972, 24 U.S.T. 2389, 961 U.N.T.S. 187, *available at* <http://www.unoosa.org/pdf/publications/STSPACE11E.pdf> [hereinafter Liability Convention]; Outer Space Treaty, *supra* note 7, art. VII. *See* INTERNATIONAL LAW COMMISSION, DRAFT ARTICLES ON RESPONSIBILITY OF STATES FOR INTERNATIONALLY WRONGFUL ACTS, WITH COMMENTARIES, comment to art. 47, in Rep. of the Intl'l Law Comm'n, 53d Sess., U.N. Doc. A/56/10; U.N. GAOR, 56th Sess., Supp. No. 10 (2001), *available at* untreaty.un.org/ilc/texts/instruments/english/.../9_6_2001.pdf.

¹⁰⁴ Legality of the Threat or Use of Nuclear Weapons, Advisory Opinion, 1996 I.C.J. 226, ¶ 30 (July 8).

¹⁰⁵ AP I, *supra* note 14, art. 35(3). It is important to note that the United States does not see this provision as part of customary international law. *See* Memorandum for John H. McNeill, *supra* note 20, at 399. The Environmental Modification Convention, to which the United States is a party, contains a similar prohibition but it is narrower in scope. It only applies when the environmental modification is being done intentionally as a means of warfare. Therefore it would apply in instances where a belligerent sought to create orbital debris as a means of warfare. Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques at arts. I-II, *opened for signature* May 18, 1977, 31 U.S.T. 333, 1108 U.N.T.S. 151 (entered into force Oct. 5, 1978) [hereinafter ENMOD]. *See also* Fleck, *supra* note 14, at 132-33. However, The ENMOD Convention specifically mentions outer space affirming that it is part of the natural environment. ENMOD, *supra*, art. II.

¹⁰⁶ DINSTEN, *supra* note 24, at 191.

¹⁰⁷ NASA Orbital Debris Program Office, *supra* note 96 ("Debris left in orbits below 600 km normally fall back to Earth within several years. At altitudes of 800 km, the time for orbital decay is often measured in decades. Above 1,000 km, orbital debris will normally continue circling the Earth for a century or more.").

dispute as whether such damage is severe or not, since the "[t]he probability of two large objects (> 10 cm in diameter) accidentally colliding is very low."¹⁰⁸ However, these collisions do take place, and are more likely as orbital debris increases.¹⁰⁹ The meaning of severe under AP I "is not sufficiently clear."¹¹⁰ One can look to the Environmental Modification Convention (ENMOD) in order to clarify the term. The Understanding attached to Article 1 of the ENMOD Convention states that severe refers to "serious or significant disruption or harm to human life, natural and economic resources or other assets."¹¹¹ It can certainly be argued that orbital debris significantly harms economic interests in space by placing multimillion-dollar assets at risk. Also, space debris poses a threat to the natural resource of orbits. However, this definition of severe is limited by its terms in the ENMOD convention, which itself is a narrower prohibition than that of AP I.

Not all attacks on satellites will be considered indiscriminate. Possibilities for planners to choose methods and means that do not create indiscriminate attacks in space do exist. Attacks that use technologies that dazzle or blind a remote sensing satellite in order to keep it from viewing a specific area will leave the satellite intact and still controlled by the adversary.¹¹² The same can be said of jamming or spoofing attacks on telecommunications or navigation satellites.¹¹³ These attacks only serve to disrupt the satellites usefulness to the adversary and not to destroy the satellite itself. Cyber attacks can also be used. While a cyber attack can be used to completely disable a satellite, it is arguable that this would not create an indiscriminate attack. The disabled satellite would fall under the definition of space debris, but it would only be a single piece instead of a cloud of debris. The creation of a single piece of space debris would probably not meet the threshold of widespread, long term, or severe under the IHL rubric.

¹⁰⁸ *Id.*

¹⁰⁹ The Kessler Syndrome is a theory that as orbital debris begins to collide it will increase the density of debris in orbit resulting in a debris belt that could threaten space access. *See generally* Donald J. Kessler and Burton G. Cour-Palais, *Collision Frequency of Artificial Satellites: The Creation of a Debris Belt*, 83 J. OF GEOPHYSICAL RES. 2637 (1978).

¹¹⁰ DINSTEN, *supra* note 24, at 191.

¹¹¹ ENMOD, *supra* note 105, annex (Understandings regarding the Convention).

¹¹² *See* DAVID WRIGHT ET AL., *supra* note 36, at 125–30. However, sufficiently powerful laser light could permanently damage the satellite. *Id.* at 128–30.

¹¹³ *See id.* at 118–23.

Conclusion

Conflict in space is not inevitable, and embracing strong international cooperation can reduce the threat of conflict.¹¹⁴ However, the political reality is that asymmetric powers will pursue their own self interests, which increases the risk of armed conflict in space. While conflict in space is not inevitable, it is prudent to be prepared for such situations. Crucial to this preparedness is understanding how the rules of international armed conflict will be applied in space. International humanitarian law has been developed for land, sea, and air operations, and addresses specific differences of each of these environments. Space is a drastically different environment, and the law will have to be adapted to address the specific issues relating to this environment. Many conflict situations that could occur in space highlight lacunae in the law of armed conflict. However, application of the core principles of international humanitarian law can help to protect the space environment so it remains available for the "benefit . . . of all countries."¹¹⁵

¹¹⁴ James D. Rendleman, *Space Assurance for the 21st Century*, 5 High Frontier Journal, no. 2, 2009, at 46–48, available at <http://www.afspc.af.mil/shared/media/document/AFD-090224-115.pdf>.

¹¹⁵ Outer Space Treaty, *supra* note 7, art. I.