

Space Warfare and the Future Law of War

by

Robert A. Ramey

A thesis submitted to the Faculty of Graduate Studies
and Research in partial fulfillment of the requirements
for the degree of **MASTER OF LAWS (LL.M.)**

Institute of Air and Space Law
McGill University
Montreal, Quebec
July 1999

© Robert A. Ramey, 1999

Unless otherwise noted, the conclusions expressed herein are solely those of the author writing in his personal capacity. They are not intended and should not be thought to represent official ideas, attitudes, or policies of any agency of the United States Government. The author has used only publicly-available information in the researching and presentation of this work.

To my father, Robert F. Ramey, the first to teach me the ultimate cause of human warfare (Jer. 17:9; Rom. 3:10-18) and point me to its ultimate cure (Is. 9:6-7; I Cor. 15:55-57).

Acknowledgments

My appreciation for assistance from the individuals named below would not have been possible without the generous provision of this research assignment by the United States Air Force. I wish to thank the institution, and those individuals responsible for selecting me for McGill's outstanding air and space law program.

My devoted wife Barbara, and little daughters Alexandra and Gabrielle put up with their share of my absences during the research and writing of this product. Without their love and understanding, this work would not have been possible. As always, they remain my number one earthly priority. I also owe my parents a debt of thanks for their very thoughtful prayers and encouragement.

A large number of other individuals graciously provided me with helpful suggestions, documents, or other professional guidance. These include: From the US Air Force, Colonel Charles Dunlap, Colonel Lake B. Holt III, Lieutenant Colonel Keith M. Sorge, Major Elizabeth Kelly, Major Robert Smith, and Mr. Darrell Phillips; from the University of Alberta, Dr. Leslie C. Green; from the Canadian Space Agency, Dr. Darius Nikanpour and Mr. Siamak Tafazoli; from the Canadian Air Force Reserve, Dr. (Maj) Louis Haeck; and from the Royal Military Academy of Canada, Professor Michel Bourbonniere. The latter two individuals thoughtfully provided me with a copy of their co-authored paper on the *jus in bello* for outer space. I also wish to thank my colleagues and friends Guy Schrenzel, for assisting me with a French translation of the Abstract, and George Dietrich for comments received on Chapter One.

A special thanks goes to Professor Michael N. Schmitt from the George C. Marshall European Center for Security Studies, formerly of the US Air Force. Professor Schmitt forwarded helpful documents and responded tirelessly to my e-mails posing questions on the law of war. He is a first-rate scholar in whom I found great inspiration.

Most significantly, my thesis supervisor, Dr. Ivan A. Vlasic, provided valuable feedback during the planning, research, and writing of this work. Having written an exhaustive treatise on law and world order in space (the first of its kind), and guided US Air Force judge advocates since 1962 (his first would later become The Judge Advocate General), it was a privilege to work under his mature direction. His disciplined, scholarly expectations motivated and encouraged me throughout. I am most grateful for his patient and indispensable guidance.

Abstract

Publicists, scholars, and practitioners of international law have yet to produce a sustained analysis of the law of war as applied to armed conflict in outer space. Though no reported cases of armed conflict in space exist, the principal spacefaring nations have contemplated space warfare for decades. Concluding that the general legal regime regulating means and methods of warfare will apply to space combat, should it occur, this thesis attempts a preliminary examination. Chapter One presents a hypothetical space warfare scenario, followed by a chapter on the history of space militarization with a review of existing (and foreseeable) technology useful for space combat. Chapter Three analyzes the international legal regime governing armed conflict, drawing conclusions for space warfare where possible. Chapters Four and Five analyze the legal regime governing the *corpus juris spatialis* (space law proper), as well as related treaties and instruments supplementing the legal norms for human activity in space, respectively. Chapter Six lays a foundational legal analysis for the application of the law of war to space combat, concluding with a section that addresses specific issues raised by such application.

Résumé

Les spécialistes du droit public, la doctrine et les praticiens du droit international doivent encore procéder à une analyse complète du droit de la guerre tel qu'appliqué à un conflit armé dans l'espace extra-atmosphérique. Bien qu'il n'existe aucun cas recensé de conflit armé dans l'espace, les principales puissances spatiales ont envisagé la guerre dans l'espace depuis des décennies. En concluant que le régime légal général régissant les moyens et les méthodes de la guerre s'appliquerait le cas échéant à un combat spatial, cette thèse tente une application préliminaire. Le chapitre Un présente un scénario hypothétique de guerre dans l'espace, suivi par un chapitre sur l'histoire de la militarisation de l'espace et un passage en revue de la technologie existante (et envisageable) utile à un combat spatial. Le chapitre Trois analyse le régime légal international qui gouverne un conflit armé en tirant, lorsque cela est possible, des conclusions pour la guerre spatiale. Les chapitres Quatre et Cinq analysent respectivement le régime légal gouvernant le *corpus juris spatialis* (droit de l'espace au sens propre du terme) et les traités connexes et les instruments complétant les normes juridiques relatives à l'activité humaine dans l'espace. Le chapitre Six procède à une analyse juridique de base sur l'application spécifique du droit de la guerre au combat spatial, en concluant au moyen d'une partie relative à des questions particulières soulevées par une telle application.

Acronyms and Abbreviations

ABL	Airborne Laser
AFI	Air Force Instruction
AFM	Air Force Manual
AFP	Air Force Pamphlet
A.J.I.L.	American Journal of International Law
Ann. Air & Sp. L.	Annals of Air and Space Law
ASAT	Anti-Satellite Weapon
AW&ST	Aviation Week and Space Technology
A.Y.I.L.	Australian Yearbook of International Law
BMDO	Ballistic Missile Defense Organization
B.Y.I.L.	British Yearbook of International Law
C3I	Command, Control, Communications, and Intelligence
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CBMs	Confidence Building Measures
CD	Conference on Disarmament
Col. J. Transnat'l L.	Columbia Journal of Transnational Law
COPUOS	Committee on the Peaceful Uses of Outer Space
C.T.S.	Consolidated Treaty Series
C.Y.I.L.	Canadian Yearbook of International Law
DMSP	Defense Meteorological Satellite Program
DoD	US Department of Defense
DoDD	US Department of Defense Directive
DSAT	Defense of Satellite Weapon
DSCS	Defense Satellite Communications System
DSP	Defense Support Program
EELV	Evolved Expendable Launch Vehicle
ELV	Expendable Launch Vehicle
EMP	Electromagnetic Pulse
EPIL	Encyclopedia of Public International Law
FOBS	Fractional Orbiting Bombing System
GAOR	General Assembly Official Record
GEO	Geosynchronous Orbit
GLTS	Gun Launch to Space
GPALS	Global Protection Against Limited Strikes
Harv. Int'l L. J.	Harvard International Law Journal
I.C.J. Rep.	International Court of Justice Reports of Judgments, Advisory Opinions and Orders
ICRC	International Committee of the Red Cross
I.L.M.	International Legal Materials
I.R.R.C.	International Review of the Red Cross

ISS	International Space Station
ICBM	Intercontinental Ballistic Missile
INMARSAT	International Maritime Satellites
INTELSAT	International Telecommunication Satellites
IRMB	Intermediate Range Ballistic Missile
ITU	International Telecommunication Union
JASSM	Joint Air-to-Surface Standoff Missile
JDAM	Joint Direct Attack Munition
JSOW	Joint Standoff Weapon
J. Air L. & Com.	Southern Methodist University Journal of Air Law and Commerce
J. Sp. L.	Journal of Space Law
JSTARS	Joint Surveillance Target Attack Radar System
LEO	Low Earth Orbit
L.N.T.S.	League of Nations Treaty Series
LOS	United Nations Law of the Sea Convention
MIDAS	Missile Detection and Alarm System
Mich. J. Int'l L.	Michigan Journal of International Law
Mil. L. Rev.	Military Law Review
MOL	Manned Orbiting Laboratory
MTCR	Missile Technology Control Regime
NASA	National Aeronautics and Space Administration
N.I.L.R.	Netherlands International Law Review
NPS	Nuclear Power Source
NRO	National Reconnaissance Office
NTM	National Technical Means
N.Y.I.L.	Netherlands Yearbook of International Law
OST	Outer Space Treaty
RLV	Reusable Launch Vehicle
RMA	Revolution in Military Affairs
SAM	Surface to Air Missile
SAINT	Satellite Interceptor
SBIRS	Space-Based Infrared System
SBL	Space-Based Laser
Sp. Pol.	Space Policy
UK	United Kingdom
U.N.	United Nations
U.N.G.A.	United Nations General Assembly
U.N.T.S.	United Nations Treaty Series
US	United States
USAF	United States Air Force
USAF J. L. Studies	United States Air Force Academy Journal of Legal Studies
USMC	United States Marine Corps
USSPACECOM	United States Space Command
USSR	Union of Soviet Socialist Republics
U.S.T.	United States Treaty Series
U. Tol. L. Rev.	University of Toledo Law Review
Yale J. Int'l L.	Yale Journal of International Law

Table of Contents

Acknowledgments.....	iv
Abstract.....	v
Résumé.....	vi
Acronyms and Abbreviations.....	vii
Table of Contents.....	ix
Introduction	1
Chapter One: Space War in 2031	7
Chapter Two: The Military Ascent to Space.....	19
A. Origins and Evolution of Space Militarization.....	20
1. <i>Missiles and Rockets</i>	20
2. <i>Nuclear Devices</i>	25
3. <i>Satellites</i>	27
B. The Space Environment and Evolution of Manned Missions	33
C. Present and Potential Technologies Available for Space Combat.....	38
1. <i>Electromagnetic and Radiation Weapons</i>	39
2. <i>Kinetic Energy and Hypervelocity Weapons</i>	41
3. <i>Laser Weapons</i>	43
4. <i>Particle Beam Weapons</i>	45
5. <i>Explosive Proximity Weapons</i>	46
6. <i>'Soft Kill' Weapons</i>	47
Chapter Three: The Law of War.....	48
A. Jus in Bello vs. Jus ad Bellum.....	51
B. Customary Principles within the Law of war	53
1. <i>Military Necessity</i>	54
2. <i>Discrimination</i>	56
3. <i>Proportionality</i>	58
4. <i>Humanity</i>	60
C. Treaty Law.....	63
1. <i>Hague Conventions of 1899 (I-IV) and 1907 (I-XIV)</i>	65
2. <i>Geneva Conventions of 1949 (I-IV) and Protocols of 1977 (I-II)</i>	71
3. <i>Additional Conventions Adopted Since 1972 Affecting the Jus in Bello</i>	78
4. <i>Jus Ad Bellum Under the United Nations Charter</i>	80

Chapter Four: Space Warfare Under the <i>Corpus Juris Spatialis</i>	86
A. Customary Law	89
B. Treaty Law	94
1. <i>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)</i> – 1967	95
2. <i>Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue and Return Agreement)</i> – 1968	106
3. <i>Convention on the International Liability for Damage Caused by Space Objects (Liability Convention)</i> – 1972	110
4. <i>Convention on Registration of Objects Launched into Outer Space (Registration Convention)</i> – 1975	112
5. <i>Agreement Governing the Activities of States on the Moon and other Celestial Bodies (Moon Agreement)</i> – 1979	115
Chapter Five: Space Warfare Under Related Treaties and Other Authoritative Sources	120
A. Treaties	120
1. <i>Treaty Banning Nuclear Weapons in the Atmosphere, In Outer Space and Under Water (Limited Test Ban Treaty)</i> – 1963	120
2. <i>Anti-Ballistic Missile (ABM) Treaty</i> – 1972	122
3. <i>Antarctic Treaty</i> – 1959, and the <i>United Nations Convention on the Law of the Sea</i> - 1982	127
B. United Nations General Assembly Resolutions	129
1. <i>Declaration of Legal Principles Governing State Activity in the Exploration and Use of Outer Space</i> – 1963	131
2. <i>Principles Relating to Remote Sensing of the Earth from Outer Space</i> – 1986	132
3. <i>Principles Relevant to the Use of Nuclear Power Sources in Outer Space</i> – 1992	136
4. <i>Declaration of International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interests of All States, Taking into Particular Account the Needs of Developing Countries</i> – 1996	139
C. International Telecommunication Union	140
Chapter Six: The Law of war in Outer Space	142
A. Bases on Which the Law of war Applies to Outer Space	145
1. <i>Analogy</i>	145
a. <i>Parallels to Sea Warfare</i>	146
b. <i>Previous Application of the Law of War to Aerial Warfare</i>	147
2. <i>Outer Space Treaty</i>	148
3. <i>Martens' Clause</i>	149
B. Problems of Legal Definition and the Use of Force in Space	151
1. <i>Militarization of Space</i>	151
2. <i>Weaponization of Space</i>	152

3. <i>Use of Force in Space</i>	155
C. National Policy, Military Space Doctrine, and Law of War Manuals	158
D. "Information" Warfare	162
E. Selected Issues	165
1. <i>Military Interaction With Intergovernmental Agencies and "Dual Use" Assets</i>	165
2. <i>The Status of Astronauts as Both "Envoys of Mankind" and Combatants</i>	171
3. <i>Return of Astronauts Engaged in Combatant Activities</i>	174
4. <i>"Innocent Passage" through Airspace for Destinations to and Return from Space</i>	175
Conclusion	177
Selected Bibliography	181

Introduction

[T]he lawful bearing of arms – under a strict code of military justice and within a corpus of humanitarian law – has been accepted as a practical necessity.¹

John Keegan (1993)

Some may reasonably wonder, for purposes of analysis under the international law of war, whether there is any meaningful distinction between warfare prosecuted from within airspace and warfare prosecuted from within outer space. In both cases, the military assets above the earth's surface may support the combat occurring below, or may engage targets in the same combat environment. Given this, some may view armed conflict from and within outer space as simply a subset of air warfare. Others may see armed conflict in outer space as superior to air warfare – that is, air warfare as a subset of space warfare. Still others may view space conflict as a new category of combat that is *sui generis*. We can state the question more simply as follows: is the “aerospace” environment fundamentally one field of combat operations, or two?

This thesis suggests that for purposes of analysis under the laws of armed conflict, space combat will be *sui generis* – fundamentally different from combat in terrestrial airspace.² This approach raises at least three implications for the analysis undertaken herein. First, space combat will not be analyzed as simply an extension of air combat; the two are fundamentally different types of combat suggesting different doctrinal tenets of

¹ J. Keegan, *A History of Warfare* (New York: Alfred A. Knopf, 1993) at 5.

² Professor Matte argues that “airspace” is a misnomer, and that the proper term is “air medium.” He makes this distinction in arguing against “any kind of arbitrary demarcation between ‘air space’ and ‘outer space.’” N.M. Matte, *Aerospace Law: Telecommunications Satellites* (Toronto: Butterworth & Company, 1982) at 11, n. 31. Professor Matte further observed that the two environments are “*at present* governed by two different legal regimes,” *ibid.* [emphasis added], but that the more logical approach is to speak of an aerospace continuum. On this approach, “the rules and norms of aeronautical law, on the one hand, and of aerospace law, on the other hand, should be applied according to functional criteria, i.e., the type of activity being carried out.” *Ibid.* This contrasts with the “traditional view” of crafting and applying law to the medium in which the activity is carried out, either air or space. Though insightfully recognizing the great difficulty of establishing a non-arbitrary boundary between air space and outer space, this view, if applied to armed conflict, would identify applicable norms limiting weaponry and methods of warfare based on a functional approach, rather than on where the combat occurs. The difficulty with this from a military point of view lies in the conceptual challenge of creating warfare policy, doctrine, and operating plans without a clear demarcation of the theater of operations. See, e.g., W.B. Scott, “Pentagon Considers Space As New Area of Responsibility” *AW&ST* 146:12 (24 March 1997) 54 [hereinafter Scott, “Space as New Area of Responsibility”].

power. While the military use of space has traditionally been viewed as a medium from which to support terrestrial warfare, including air warfare, space as a medium of warfare itself raises entirely different legal and operational issues.³ Thus, freed from a strict air warfare paradigm, the effort to establish limits on space combat in its own right can draw principles of armed conflict from those applicable to land and sea warfare, as well as from those governing air warfare.

Second, one of the key differences of space warfare, at least for the near future, will be the spatial separation of human combatants from their weaponry. Whether kinetic energy or space-based laser weapons in low earth orbit, or jamming satellites used to corrupt telecommunications signals in geosynchronous orbit, the warrior is distant from his instruments of war by between 100 and 22,500 kilometers. When seeking to apply the current laws of war, it appears this phenomenon will require new ways of thinking about a legal regime that has as its purpose the amelioration of human suffering. Beyond simply targeting other combatants, terrestrial infrastructure, or weapons systems, space warfare primarily contemplates the destruction of unmanned military assets in the air or space environment.⁴ Given these factors, it seems that the minimization of human

³ One author aptly terms the difference "significant." R.D. Newberry, *Space Doctrine for the Twenty-first Century* (Maxwell AFB: Air University Press, 1998) at 10. The difference is helpfully illustrated by three representative schools of thought on the relationship between military activity and outer space: (1) space as a demilitarized sanctuary; (2) space as the high ground; and (3) space as a theater of operations. J.E. Justin, "Space: A Sanctuary, the High Ground, or a Military Theater?" in U. Ra'anan & R.L. Pfaltzgraff, Jr., eds., *International Security Dimensions of Space* (Hamden, CT: Archon Books, 1984) 102-109 [hereinafter Justin]. The first view recognizes a minimal role for the military use of space but not its weaponization. Two thoughtful, moderated accounts representing this view were recently provided two USAF officers. One aims at "opening the debate" on the space sanctuary view. B.M. DeBlois, "Space Sanctuary: A Viable National Strategy" (Winter 1998) 12:4 *Airpower J.* 41 [hereinafter DeBlois]. The other claims to present the "strongest possible argument for a space sanctuary today." D.W. Ziegler, *Safe Heavens: Military Strategy and Space Sanctuary Thought* (Montgomery, AL: Air University Press, 1998). The second of the three schools of thought, sees the role of military activity in space as principally supportive of terrestrial combat and could include the use of weapons from space. This view stresses the inseparability of the air and space media, and makes heavy use of the term "aerospace," a term coined in 1958 by USAF Chief of Staff General Thomas White. Justin at 107; see also Spires, *infra* note 56 at 54. The third view represents the most complete use of space for military purposes. This view sees space not merely as another medium in which to augment existing military roles, but as an emerging combat environment, or military mission, in its own right. The present author's analysis rests on the conclusion that international law does not prohibit the use of outer space as a complete military theater of operations per se. This assumes that any force used as part of military operations in space is compliant under the *jus ad bellum*. For a discussion of the *jus ad bellum* see *infra* notes 210 through 212 and accompanying text.

⁴ The unmanned assets within space are obvious – satellites and missiles. The unmanned assets within airspace include what have come to be known as Unmanned Aerial Vehicles (UAVs), currently used for surveillance, as well as missiles either headed for or from space or used entirely within airspace.

suffering, the chief goal of the laws of war, is already achieved to some extent for space as compared with the other combat environments. From this observation follows the conclusion that with respect to space warfare as it is currently conceived, the law of war will be more applicable to regulation of means and methods of war, than to the protection of human life.⁵

Third, the first implication notwithstanding, the legal analysis of issues unique to space combat, such as the legality of new space means and methods of warfare, cannot rely solely on analogy with other legal relationships governing other combat environments. This is due in part to the relative infancy of the prospect of space warfare and to the recency of its technology. To a certain extent, the international regulation of space combat will evolve only *subsequent* to state action making such combat an imminent possibility.⁶ Because the law governs actual social relations and not theoretical abstractions, and because there have been no reported or anticipated cases of actual space combat, conclusions about legal restrictions on such combat must begin tentatively. This is not to abandon hope of outlining contours of the legal regulation of space combat under existing international norms; certain points do clearly emerge from the analysis. It is simply to realistically acknowledge the limitations of such an inquiry at this time. States faced a similar dilemma in the days leading up to World War I with aerial combat. At that time, one could hardly establish firm legal principles in the absence of State practice.⁷

⁵ This is to say that as long as space warfare is prosecuted through unmanned missions against assets in the space environment, that portion of the law of war traditionally known as "Hague Law" (see *infra* notes 269 through 296 and accompanying text) will govern space warfare more readily than that portion known as "Geneva Law" (see *infra* notes 297 through 308 and accompanying text).

⁶ Professor Schmitt has pointed out that on rare occasion, international law has sought to outlaw the deleterious effects of certain anticipated technologies. In this regard he cites the ban on blinding laser weapons, adopted before such weapons had ever been used in military operations. "Much more frequently, however, law has proven *reactive*. Indeed, in the twentieth century, codification efforts have followed major wars in almost lock-step fashion." M.N. Schmitt, "Bellum Americanum: The U.S. View of Twenty-First-Century War and Its Possible Implications for the Law of Armed Conflict" in M.N. Schmitt & L.C. Green, eds., *The Law of Armed Conflict: Into the Next Millenium*, International Law Studies, Vol. 71 (Newport, RI: Naval War College, 1998) 389, reprinted in (1998) 19 Mich. J. Int'l L. 1051 [hereinafter Schmitt, "Bellum Americanum"].

⁷ As Geoffrey Best puts it, "there was no international law on aerial warfare before the turn of the century. The Hague Conferences [of 1899 and 1907] gingerly laid a few foundations. . . . but the terms used were soon discovered to be archaic, and vital questions had been begged." G. Best, *War and Law Since 1945* (Oxford, UK: Oxford University Press, 1994) at 199. It will be difficult to avoid similar mistakes as States contemplate moving into uncharted legal territory once again.

As was the case in the 1910s with respect to air warfare, a great deal of original reflection on the implications of space combat is needed today.

This thesis will examine the intersection of two subsets of public international law: the law of war and the law of outer space. The analysis will focus on the relevant legal issues from the perspective from the United States, currently the most active spacefaring nation on earth. Because the American vision for space war is the most "developmentally mature,"⁸ it is a virtual certainty that American practice will dominate the development of international law limiting the means, methods, and extent of the use of force in space.

Chapter One begins with a fictional account of geopolitical factors leading up to the world's first war in outer space. Though there had been "space wars"⁹ prior to 2031, these simply amounted to conflicts in which ground, sea, and air components relied heavily on *support* assets from space. By contrast, the scenario described in Chapter One envisions warfare involving the application of force both from and within the space environment.

Chapter Two presents a historical review of the development of military activity in space. It discusses reactions by the international community to new weapons such as the V-2 rocket, cruise missiles, intercontinental ballistic missiles, and nuclear devices. It also examines the history of US military satellite development. This chapter also presents

⁸ Schmitt, "Bellum Americanum," *supra* note 6 at 390.

⁹ For example, Operation Desert Storm has been widely termed the first "space war." See, e.g., General T. Moorman, quoted in R. Saltus, "Air Force says it Might Have Won the War in 2 More Weeks" *The Boston Globe* (5 April 1991) 10. Similarly, the North Atlantic Treaty Organization (NATO) Operation Allied Force air strikes against Yugoslavia in 1999 were even more heavily supported by space assets than Desert Storm. In the Yugoslavian conflict, although the United States Space Command (USSPACECOM) classified all orbital data on US military spacecraft during the conflict stating that even the *reason* for the classification remained classified (suggesting the critical role space systems played), several facts were apparent. NATO made heavy use of two National Reconnaissance Office (NRO) Lacrosse imaging radar satellites for pre-strike intelligence and post-strike bomb damage assessment with resolutions of 1 to 3 meters. With more precise resolutions, NATO used NRO's 3 KH-11 satellites for more sensitive optical and infrared imagery. It was also thought that NATO was using as many as three other of NRO's highly secret smaller imaging spacecraft. For weather data, NATO used 10 spacecraft, including 4 USAF DMSP spacecraft flying in 500-mile polar orbits and 2 European Meteosat spacecraft in geosynchronous orbits. As in Desert Storm, Allied Force made heavy use of the 24 medium earth orbit satellites comprising the Global Positioning System (GPS). These were used for precision strikes guiding both munitions and aircraft. See C. Covault, "Military Space Dominates Air Strikes" *AW&ST* 150:13 (29 March 1999) 31. In addition to the Meteosat assets, several other non-US space systems also contributed to NATO's effort including France's Helios 1 military imaging satellite which provided images of 1 to 5 meter resolutions. See P. Sparaco, "French Satellite Details Air Strike Damages" *AW&ST* 150:15 (12 April 1999) 26.

aspects of existing and foreseeable technology for armed conflict within and from outer space.

Chapters Three through Five consider international law applicable to space warfare. Chapter Three analyzes international law pertaining to armed conflict and distinguishes between the *jus in bello* and the *jus ad bellum*. Further, Chapter Three outlines the key principles derived from treaties and customary international law, and clarifies that “law of war,” “law of armed conflict,” and “humanitarian law” are phrases that have come to be largely synonymous with each other. Chapter Four examines the five multilateral space treaties comprising the *corpus juris spatialis*, and highlights key passages of relevance to space warfare. Chapter Five considers related authorities such as the Limited Nuclear Test Ban Treaty, Anti-Ballistic Missile Treaty, Antarctic Treaty, and the United Nations Convention on the Law of the Sea, as well as four United Nations General Assembly (UNGA) Resolutions. Though not regulating outer space activity per se, the treaties are relevant either because of inherent parallels they have to the regulation of outer space, or because they contain specific provisions limiting space activities.

Chapter Six applies the legal regime governing international armed conflicts to space warfare. Here, the thesis examines the bases on which the law of war applies to outer space. In doing so, the thesis suggests that the process by which the law of war was applied to the last new combat medium – air – serves as a model for the likely development of the international regulation of space warfare. Chapter Six also discusses problems of definition within the *corpus juris spatialis* that challenge any effort to apply the law of war to space combat. It further outlines US national and military space policy as well as highlights the role that State law of war manuals might play in the future development of restrictions on space warfare. Chapter Six also briefly considers “information” warfare, a topic of growing concern to the US military.

Chapter Six concludes by addressing special problems arising from, *inter alia*, the prospect of applying the law of war to space warfare. This section will analyze the significant problem posed by space assets dedicated to uses of both a civilian and military nature. It will also examine the status of assets owned both by belligerent and neutral states, as well as assets owned by opposing belligerents. It will further consider legal problems raised by the military status of astronaut combatants in light of the status

conferred on all astronauts under current space law, as well as the question of whether astronauts found in foreign territory must be returned to opposing belligerents in time of war.¹⁰ Chapter Six concludes by examine whether proposed rights of innocent passage through foreign airspace for the purpose of accessing outer space will factor in the future regulation of means and methods of space warfare.

¹⁰ Though several interesting studies consider the possibility of warfare with extra-terrestrial forms of intelligent life, such consideration is far beyond the scope of this thesis. Such analyses also exceed the scope of international law proper. Nonetheless, these works often make useful observations about future space weaponry and the difficulty of scientific prediction. For example, one sober, scientifically respectable work considers the technological preconditions for successfully defending against alien attack, distinguishes his project from that of mere science fiction, and points out the importance of allowing authors "free rein" in speculating about future technologies. "Suppose an observer of the Wright brothers' memorable first flight at Kitty Hawk had been given the assignment of foretelling what aviation would be like seventy or so years later. Had he envisaged the wide-bodied jet or the supersonic transport he would have been absolutely correct. He would also have been laughed to scorn by his contemporaries at the time. Had he merely enlarged the Wright brothers' frail biplane into some bigger, stronger thing with umpteen engines and several sets of wings, chances are he would have been considered a true visionary even though his projected creation might be more akin to a flying bird-cage." J.W. MacVey, *Space Weapons Space War* (New York: Stein and Day Publishers, 1979) at 80. See also D. Langford, *War in 2080: The Future of Military Technology* (New York: William Morrow and Company Incorporated, 1979).

Chapter One: Space War in 2031

Technology permeates every aspect of war, but . . . [w]ar will remain predominantly an art, infused with human will, creativity, and judgment.¹¹

Lieutenant General Paul K. Van Riper,
USMC (1997)

Never was the old maxim “in war things which are necessary to attain the end in view are permissible”¹² more keenly felt than during the war of 2031. Violations of international law were being reported on both sides – perfidious misuse of the white flag, indiscriminate targeting, noncombatants treated as prisoners of war, prisoners of war executed en mass, use of “human shields” against military targets, weapons openly stored in cultural and religious structures, nuclear weapons stationed in orbit, use of bacteriological weapons, radiological weapons, on and on it went. Gone was any hope of facilitating the restoration of peace. Traditional doctrines of war designed to restrain needless violence in war were disregarded. The East increasingly viewed the law of war with suspicion, as a western contrivance foisted on the world to deny military parity. The West, terrified at the Eastern displays of hostility and resolve to gain world domination, would observe the law of war when convenient, but never when it might lead to disadvantage.

Though Western nations still maintained their long-established military technological superiority over their adversaries in the East, if less and less so, the Western powers did not fully appreciate the risks of such superiority. “Technological superiority” was still thought to be synonymous with tactical and strategic superiority. Further, the West continued to view warfare as a uniquely military phenomenon. By contrast, the total societal immersion into the war effort by the Eastern powers was yielding measurable strategic benefits. Every sector of the Eastern societies were mobilized. For a while, it looked like their larger industrial and population bases would allow them to

¹¹ P.K. Van Riper, “Information Security” *Marine Corps Gazette* (June 1997) 54 at 62 (quoted in C. Dunlap, “A Virtuous Warrior in a Savage World” (1997-1998) 8 *USAFA J. L. Studies* 71 at 73 [hereinafter Dunlap, “A Virtuous Warrior”]).

¹² H. Grotius, *De Jure Belli ac Pacis*, quoted in G. Best, *War and Law Since 1945* (Oxford, UK: Clarendon Press, 1994) at 30.

outlast the West. Eastern manned space missions were being launched by the week. And, though the belligerents prosecuted the war in all four combat environments,¹³ most believed that space force application would soon be decisive in the quest for global dominance. It was, to borrow a cliché, the ultimate “high ground.”¹⁴

For decades before the war, and even in the midst of it, the leading nuclear powers maintained a tacit agreement to refrain from using their nuclear arsenals unless the very survival of the nation was at stake. In just about every conflict through the first three decades of the twenty-first century the threat of nuclear retaliation overpowered a State’s urge to launch a preemptive strike.¹⁵ This much remained constant. Nonetheless, prior to the outbreak of hostilities several growing world tensions gave clear warning of the impending armed conflict. Most observers realized on reflection that diplomatic and cultural gestures of goodwill preceding the war masked the underlying geopolitical tensions,¹⁶ noted below in reverse chronological order.

No one really knows where asteroid MD 33 came from (or why it had never been seen). Most theorize the rogue mini-planet emerged from the Oort cloud beyond Pluto.¹⁷

¹³ Land, Sea, Air, and Space. There is of course a less conventional fifth warfare environment – information. See *infra* Chapter Six, Section D.

¹⁴ For example, in the late 1950s, Senator Lyndon Johnson referred to space as the “high ground.” W.E. Burrows, “The Military in Space: Securing the High Ground” in J.M. Collins & S.K. Kraemer, eds., *Space: Discovery and Exploration* (Washington, DC: Smithsonian Institution, 1993) 121. In 1974 General Jacob E. Smart (Ret.) stated “Today and henceforth the United States must be prepared to defend itself against aggression in space and from space. We cannot surrender that ‘high ground’ without contest.” Quoted in J.C. Glenn & G.S. Robinson, *Space Trek: The Endless Migration* (Harrisburg: Stackpole Books, 1978) at 157. See also D.S. Anderson, “A Military Look into Space: The Ultimate High Ground” [1995] Army L. 19.

¹⁵ Thus, the general reluctance to use nuclear weapons short of an anticipated total annihilation was not motivated by any State’s respect for the rule of international law. Though the International Court of Justice claimed in its 1996 advisory opinion on nuclear weapons (see *infra* note 198) that use of such weapons for reasons short of defense against total annihilation was legally suspect (generally “contrary to rules of international law applicable to armed conflict”), it was for military and political reasons, not respect for the law, that States refrained.

¹⁶ The leading superpowers consistently spoke of “cultural exchanges” and “strategic partnerships.” Despite the rise of western goods and services into Eastern markets – leading many to uncritically assume cultural homogeneity (as if to say “they look just like us, they must *be* just like us”) – divergent value systems, separately developed over several millennia, ultimately motivated each side’s behavior in different directions.

¹⁷ Named for Dutch astronomer Jan Hendrick Oort, the Oort cloud is a spherical portion of space enveloping earth’s solar system and extending half way to the nearest star. Referred to as the “Siberia of the solar system,” it is thought to contain trillions of inactive comets. P.R. Weismann, “The Oort Cloud” *Scientific American* 279:3 (September 1998) 84.

It clearly did not display the typical makeup of “asteroid belt”¹⁸ asteroids, and was almost 1200 kilometers across making it even larger than Ceres, the previously largest known asteroid.¹⁹ Whatever the source, preliminary infrared spectrometry suggested in 2026 that the asteroid contained large quantities of plutonium 238. Although its security implications were obvious, existing international law stood in the way of national military conquest.²⁰ Nonetheless, many States began secretly preparing to be the first to explore (and harvest) the gigantic body’s primary strategic resource.

What states could not do by way of outright national appropriation, private consortiums acting under State supervision could.²¹ Without any regulatory regime to govern private interests in space, multinational corporations began appropriating parts of celestial bodies. One unaccustomed to thinking in national security terms did not normally think of this practice as having military implications. But history was replete with examples attesting to the relationship between a nation’s private and public interests: the military invariably followed national private enterprises operating abroad, providing

¹⁸ Consisting of more than 40,000 asteroids with a diameter one kilometer and larger, the asteroid belt is generally confined to the vast region of space between the orbits of Mars and Jupiter. See J.S. Lewis, *Mining the Sky: Untold Riches from the Asteroids, Comets, and Planets* (Reading, MA: Addison-Wesley, 1996) at 187-188.

¹⁹ *Ibid.* at 188.

²⁰ As a “celestial body” under international law, MD33 was beyond the reach of national appropriation by any sovereign state. Article II of the *Outer Space Treaty*, ratified by 95 States with an additional 27 signatories as of 1999 (including all current and developing space powers) reads: “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.” *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, 27 January 1967, 610 U.N.T.S. 205, 18 U.S.T. 2410, T.I.A.S. No. 6347 (entered into force 10 October 1967).

²¹ As early as 2001, private entrepreneurs were declaring ownership of asteroids. See, e.g., P. Landesman, “Starship Private Enterprise” *The New Yorker* (26 October 1998) 178. As a matter of law, the possibility of private appropriation was widely rejected in the late twentieth century as an implicit violation of the *Outer Space Treaty*’s “no-sovereignty-in-outer-space” provision. However, growing privatization of space activities, recognition of the economic benefits of commercialization, differentiation of space resources from ocean resources, and hesitation among venture capitalists to invest short of security interests backed by ownership led to a gradual change in practice and law. Over time, the legal community acknowledged that customary practices had evolved into customary law. The positions of Gorove and Wassenberg that private appropriation did not violate the *Outer Space Treaty*, a distinct minority view in 1999, became the majority view by the 2020s. See H. Wassenbergh, “Responsibility and Liability for Non-Governmental Activities in Outer Space” in *ECSL Summer Course on Space Law and Policy: Basic Materials* (Dordrecht: Martinus Nijhoff Publishers, 1994) 197 *et seq.*; S. Gorove, “Interpreting Article II of the *Outer Space Treaty*” (1969) 37 *Fordham L. Rev.* 349 at 351. Some were noting the general change even in the late 1990s. Thus, “some scholars writing in the wake of the *Outer Space Treaty*’s ratification took the position that Article 2’s no-sovereignty provisions bar *any* property rights in outer space resources. That position has lost its popularity over time, however, and is no longer held by many scholars.” G.H. Reynolds & R.P.

protection as necessary.²² The widespread commercialization of space offered greater, not lesser, opportunities *and reason* to militarize space.²³ Thus, low earth orbits were bristling with military weaponry by 2031.

Despite the lack of useful technology necessary to harvest the asteroid's resources, the competition among nations to find a way was fierce. The developing spacefaring nations, which resented United States access and use of space as well as technological superiority in the twentieth and early twenty-first centuries, were not willing to rely on diplomacy in order to improve their inferior positions in space. The Next Generation Space Telescope (NGST) was nearing the end of its useful life in 2028.²⁴ From its position at the L2 Lagrange point²⁵ the telescope could "see" far beyond its progenitor,

Merges, *Outer Space: Problems of Law and Policy*, 2nd ed. (Boulder, CO: Westview Press, 1997) at 82 [hereinafter Reynolds & Merges].

²² In 1998, though before this as well, commentators were increasingly observing the symbiotic, interdependent relationship between the military and private space industry. See, e.g., P. Lawrence & A. Hansson, "American Space Hegemony: Accident or Design?" (February 1998) 14:1 Sp. Pol. 2. This relationship, although in somewhat altered form, was explicitly recognized by the US military. In its document entitled "Vision for 2020," USSPACECOM stated that the development of its space forces would "follow" the model established by land and sea power. "Historically, military forces have evolved to protect national interests and investments – both military and economic. During the rise of sea commerce, nations built navies to protect and enhance their commercial interests. During the westward expansion of the continental United States, military outposts and the cavalry emerged to protect our wagon trains, settlements, and railroads." USSPACECOM, *Vision For 2020* (February 1997), online: United States Space Command Homepage <<http://www.spacecom.af.mil/usspace/visbook.pdf>> (date accessed: 21 January 1999). Thus, USSPACECOM accurately predicted that the missions of its space forces would evolve the same way land, sea, and air forces did. *Ibid.*

²³ Since well before 1999 military space officials had been warning commercial operators of various threats. These included navigational jamming, disruption of satellite optical systems with directed-energy devices, and radio frequency jamming to disrupt command and data links. Given increasing US dependence on space assets, the threat to commercial satellites became a threat to national security. For example, by 1999 approximately 60% of US military satellite communications traveled over commercial systems. W.B. Scott, "Space Chief Warns of Threats to U.S. Commercial Satellites" *AW&ST* 150:15 (12 April 1999) 51. That dependence skyrocketed in the early decades of the twenty-first century.

²⁴ See P.S. Hardersen, "A Year of Major Discoveries from the Hubble Space Telescope" *Ad Astra* 9:6 (November 1997) 26 at 30.

²⁵ *Ibid.* A "Lagrange point," named for eighteenth century astronomer Pierre Lagrange, is a three-dimensional position in space. Also known as a "libration point," it exists by virtue of the gravitational balance between two celestial bodies. These points are thought to be stable gravitationally and thus suitable for the "stationing" of space assets which could linger for long periods of time without expending significant fuel. The L2 Lagrange point is 280,000 miles (450,800 km) from earth on the far side of the Moon. It was believed in 1999 that the Earth-Moon system had 5 Lagrange points, L1 through L5, any one of which would hold tremendous military value for space weaponry. This had been recognized for at least 95 years, as Mackinder's observation made clear: "Who rules circumterrestrial space commands Planet Earth; Who rules the moon commands circumterrestrial space; Who rules L4 and L5 commands the Earth-Moon system." H.J. Mackinder, "The Geographical Pivot of History" *Geographical Journal* 23 (1904) 421. In 1999, libration point theory remained just that, theory. "The validity of these hypotheses, however, has not been verified empirically. There are no observable counterparts of the Trojan asteroids that inhabit

the Hubble Space Telescope. Before the NGST's solar cells went dead however, it allowed astronomers to project that asteroid MD33 would pass within 156,000 kilometers of planet earth on 3 November 2030.²⁶ Several states pegged their national security to acquisition of MD33's riches.

Following the 2025 shooting incident on board the International Space Station (ISS), the United States Space Force²⁷ sent a Space Shuttle III mission to investigate. Although the victim was not a United States national (he was Argentinean) the US was greatly concerned that the offender would not be prosecuted. Unusual as it was for the orbiting manned Chinese command post²⁸ to rendezvous with the International Space Station, Chinese military authorities had no other viable option when the crippled craft

areas analogous to L4 and L5 along Jupiter's orbit. No probe from Earth has ever confirmed or denied the presence of particle clouds that some scientists believe must be held captive. The size, shape, and importance of each lunar libration area thus remain subjects for speculation." J.M. Collins, *Military Space Forces: The Next 50 Years* (Washington: Pergamon-Brassey's International Defense Publishers, 1989) at 22 [hereinafter Collins]. Though this theory was proved accurate prior to the hostilities of 2031, space weaponry was still rather crude, and none of it had been stationed at any of the libration points.

²⁶ Some suspected that in the early twentieth century the U.S. Air Force suspected the existence of MD 33. Its little known asteroid-finding LINEAR telescope at the White Sands Missile Range set the technological "gold standard" for such telescopes. Its powerful computer could interpret the telescope's observations in milliseconds, rather than the 2 minutes required by the leading competitors. Thus, it seemed inconceivable that such a device could have missed the orbit of such a significant body as MD 33 until the mid-2020s. See T. Ortega, "Air Force Telescope Preempts Comet Hunters" *Astronomy* 27:4 (April 1999) 60.

²⁷ Commentators, politicians, academics, and military members had been calling for such a move for years. For example, in 1970 Robert Salkeld's provocative volume *War and Space* claimed that space warfare was a virtual inevitability. "The concept which naturally suggests itself is the eventual creation and growth of a fourth major service, a United States Space Force, which might function at budgetary parity with the Army, Navy and Air Force." R. Salkeld, *War and Space* (Englewood Cliffs, NJ: Prentice-Hall, 1970) at 189. Later, another commentator observed that "roles and missions" debates for space between the existing services would reach a fevered pitch leading to an inevitable evolution toward a separate space service. "Military space operations, much like U.S. tactical air combat power, probably will remain a specialty within several military services that squabble over respective budgets/prerogatives, until important space missions involve more than support for armed forces on Earth and powerful spokesmen present decisionmakers a persuasive case. A Solomon-style decision eventually will be unavoidable: senior officials must determine whether to deliver the military space 'baby' intact or divide it. ... A separate armed service with centralized control over all military space activities, for example, might avoid most doctrinal disputes." Collins, *supra* note 25 at 82-83. Near the turn of the century, a vocal U.S. Senator began suggesting the propriety of such a move: "The notion that the Air Force should have primary responsibility for space is not sacred. ... if the Air Force cannot or will not embrace space power. ... we in Congress will have to establish an entirely new service." B. Smith, "The Challenge of Space Power" (1999) 13:1 *Airpower J.* 32 at 37-38 [hereinafter Smith, "The Challenge of Space Power"]. Now, as a new military department within the US Department of Defense, the creation of the US Space Force in 2022 was met with international concern. The move graphically formalized what the international community already knew, namely, that space had become a recognized combat environment.

²⁸ See W.E. Leary, "Human Space Flight is in China's Future, Experts Says" *The New York Times* (13 July 1999) 1.

developed a slow atmospheric leak.²⁹ As it turned out, though the Chinese military officer who pulled the trigger killing the Argentinean astronaut was simply following Beijing's standing rules of engagement – unauthorized entrants to the command center were to be fired upon – it remained unclear why the victim was killed after he had reentered the ISS. The Chinese, for reasons still unknown, quietly removed the shooter from the post and he was never heard from again. Beijing's standing rules were not discovered by the international community until late 2030.

Several years previously, the International Telecommunication Union announced that useable satellite slots in the geostationary orbit³⁰ had been fully occupied by the nations and corporations of the world.³¹ Predictably, this announcement in 2018 set off furious attempts to implement international cooperation for the now-exhausted slots. It also kept the scientific community hard at work in devising methods which could enable active satellites to function without radio interference. It gave new impetus to upgrades in offensive anti-satellite weaponry (ASAT) as well. Besides the United States, other nations leading the ASAT modernization effort included Russia, India, Japan, Brazil, the European Union, China, and a handful of Chinese allies including North Korea, Pakistan, and Iran.³²

²⁹ As with most international treaties touching on the use of space, the International Space Station Agreement, Article 1, restricted all of the parties' ISS activities to those with "peaceful purposes in accordance with international law." *Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, The Government of Japan, The Government of the Russian Federation, and The Government of the United States of America Concerning Cooperation on the Civil International Space Station*, 29 January 1998, reprinted in S. Gorove, ed., *United States Space Law: National & International Regulation*, vol. IV (Dobbs Ferry, NY: Oceana Publications, Inc., May 1998) at 98-1 (not yet in force) [hereinafter *ISS Agreement*].

³⁰ The geostationary earth orbit, also called the geosynchronous orbit, exists some 22,400 miles (36,000 km) above the equator. At that distance, a satellite will maintain its position relative to earth's surface because its orbital period of 24 hours directly corresponds with earth's 24 hour rotation on its axis. This characteristic makes the location particularly valuable for stationing of communications satellites. Because Arthur C. Clarke first proposed use of the GEO for communications satellites, it is also sometime referred to as the Clarke orbit. See Reynolds & Merges, *supra* note 21 at 15.

³¹ As the United Nations agency providing the forum for monitoring global communications networks, the International Telecommunication Union registers GEO slots upon application by States. See, e.g., J. Wilson, "The International Telecommunication Union and the Geostationary Satellite Orbit: An Overview" (1998) XXIII Ann. Air & Space L. 241 [hereinafter Wilson]; A. Noll, "International Telecommunication Union" in Bernhardt, ed., *Encyclopedia of Public International Law* (hereinafter *E.P.I.L.*), vol. 5 (Amsterdam: North-Holland Publishing Company, 1982) 177.

³² In addition to these developments, the proliferation of Chinese arms transfers to diplomatically isolated States should have created even greater concern for the West. As two reporters noted in 1998 (well before the alleged theft of nuclear technology from the US), Chinese activity included "sales of missile technology to Iran and of special magnets that can be used in nuclear weapons building to Pakistan. [Further,] China

Looking back even further, in 2011 the United States National Reconnaissance Office fielded its latest generation intelligence satellites.³³ While the newer network was cheaper to put in place (smaller satellites launched on older Atlas-class rockets), with more advanced remote sensing capabilities, its operating capabilities, locations, and intended uses were widely known internationally due to a commitment to make the organization's activities "more open."³⁴ While the newer satellites did provide greater image resolution, and the organization's openness was politically popular, the peacetime advantages became wartime liabilities. For example, one of the biggest problems in the early 2000s remained a challenge into the early 2030s – the sophisticated adversary following the path of the signal satellite could switch off its radar tracking (or other) device and cease producing its signal. This long-standing problem was particularly frustrating to the West in 2031 given the Eastern powers' effective tactical use of its Surface to Space Missile batteries. (During the first Persian Gulf War³⁵ the Iraqis perfected a system of Surface to Air missile³⁶ trapping, subsequently adopted by other States, that continued to plague the Western air forces well into the twenty-first century.³⁷) As the potential enemy generally knew their location, reconnaissance

has built a secret, plutonium-capable nuclear reactor in Algeria; it has sold chemical weapons materials and nuclear technology to Libya; it has transferred large amounts of conventional weapons to both Iran and Iraq. [Other sales include] main battle tanks, antitank guided missiles, rocket launchers, fighter aircraft, and surface-to-surface missiles – this in addition to the help China has given to other countries in developing weapons of mass destruction." R. Bernstein & R.H. Munro, *The Coming Conflict With China* (New York: Vintage Books, 1998) at 7. These authors bluntly pointed out the Chinese response when confronted about such transfers: "...China was also defying arms proliferation agreements – which Beijing had not signed but was pledged to observe – by selling missiles and nuclear technology to countries like Iran and Pakistan and then repeatedly denying that the sales were taking place." *Ibid.* at 26.

³³ See J.C. Anselmo & P.J. Klass, "NRO Embraces Sigint Smallsats" *AW&ST* 147:13 (29 September 1997) 35. As happens with large defense programs, the system's actual deployment date in 2011 occurred several years after its scheduled deployment date.

³⁴ The security issues were only exacerbated by the Organization's political decision to place intelligence sensors on other systems, many of which were unclassified. See *ibid.*

³⁵ As Colonel Dunlap predicted in 1996, the Western nations faced an even more wily opponent during the second Persian Gulf War of 2007, one that had mastered the art of waging an asymmetrical war, that is, indirect warfare designed to avoid the enemy's strengths while exploiting its weaknesses. C. Dunlap, "How We Lost the High-Tech War of 2007: A Warning from the Future" *The Weekly Standard* (29 January 1996) 22. The ascendancy of Western reliance on information operations backfired as its open societies left vast stores of information, with cumulative intelligence value, easily accessible to Eastern militaries – militaries that were less dependant on sophisticated information systems anyway.

³⁶ Hereinafter SAM.

³⁷ The tactic was simple: lure a SEAD (suppression of enemy air defenses) aircraft into an area by illuminating it with SAM radar. Then, while the aircraft hunts for the source, another system, often using

satellites were no more effective than reconnaissance aircraft in the acquisition of enemy radar sources.

Quietly, but persistently, India continued its rise as a space power through the first three decades of the twenty-first century. Its estimated \$10 billion annual military budget in 1998 ballooned to ten times that amount in just 15 years. This was driven in large part by its increasing sense of isolation over cooperative relations between its bitter adversaries to the Northwest, Pakistan, and to the Northeast, China.³⁸ For India, as with all other military powers, space development was a fundamental component of national security policy. Because of its relentless accumulation of modern weaponry, India remained a persistent threat to its neighbors. However, though India would have been a natural ally of the Western, democratic nations, it took no part in the war.

Throughout the 2010s and 2020s the Russian Federation continued modest development of its previously dominant space program. Incessant political turmoil, however, left the Russian space programs without a strong, sustained political voice in successive Russian governments. Over time, the nation's launch capacity atrophied as older generation boosters were never sufficiently modernized. Nonetheless, the Russians' vast experience in outer space proved to be a decisive asset for the Eastern alliance during the war.

Not surprisingly, the Chinese had become the dominant Asian space power by the late 2020s. Despite China's market reforms of the 1980s and 1990s, its central government remained vigorously authoritarian. This did not bode well for the Chinese controversy of greatest interest to the West: Taiwan. China's continued firm hand in Taiwanese affairs left the Strait of Taiwan a perpetual military flashpoint.³⁹ China had

optical tracking, engages the aircraft from a different direction. See, e.g., R. Wall, "New Weapons Debut in Attacks on Iraq" *AW&ST* 149:25 (21 December 1998) 15.

³⁸ See P. Mann, "China-Pakistan Link Seen Rejuvenated" *AW&ST* 148:23 (8 June 1998) 59-60.

³⁹ Reports such as the following were typical: S. Faison, "Taiwan President Implies His Island Is Sovereign State" *The New York Times* (13 July 1999) 1; K.E. House & R. Flannery, "Arms Race Is Beijing's Call, Taiwan's Top Leaders Say" *The Wall Street Journal* (25 June 1999) 1; Agence France-Presse, "China Bars U.S. Warplanes from Hong Kong" *International Herald Tribune* (25 June 1999) 1; "Beijing Urges U.S. to Cancel Missile Sales" *Reuters News Service* (2 June 1999); P. Shennon, "U.S. Plans to Sell Radar to Taiwan to Monitor China" *The New York Times* (30 April 1999) 1; J. Mann, "China Wants to Bring Down Curtain on Taiwan Charade" *The Los Angeles Times* (28 April 1999) 1; A.S. Tyson, "US, China at Odds Over Roles in Asia" *Christian Science Monitor* (4 March 1999) 1; T.W. Lippman, "China Missile Buildup a Threat to Taiwan" *Washington Post* (26 February 1999) 20; "China Says Lee Teng-hui Pushes Taiwan into 'Abyss'" *Reuters News Service* (23 March 1996); "USS Nimitz Heads off to Monitor Taiwan Crisis"

warned the US for years that Chinese restraint in the transfer of weapons technology (principally missile, nuclear, computer, and satellite technology) to developing nations was going to be proportional to Western aid to Taipei. To China's unending frustration, and due to its unwillingness to negotiate a political compromise, US aid to Taipei continued. The last straw was the US "gift" of an orbital slot for a Taiwanese geosynchronous satellite in 2031.⁴⁰

Thus, it should really have been no surprise when, in January, 2031, the Chinese fired upon the US transport vessel launched from Taiwan and headed for the ISS. The spacecraft's stated mission was purely scientific, and was undertaken as a US-Taiwanese cooperative effort. Following a stop at the ISS, the shuttle was to continue on to the geosynchronous orbit for an early maintenance mission on Taiwan's new satellite. China maintained that Taipei's scientific interest in the ISS and its communication satellite was merely a pretext for acquiring information about Beijing's space technology. As it turned out, China was correct. Almost as troubling to the Chinese was the highly-publicized fact that the Taiwanese satellite was powered by plutonium 238.⁴¹ The Americans were pleased with a new marketing slogan used for their civilian satellite exports, well-adapted to the Taiwanese satellite: "fuel for spaceflight: used in space, provided from space" – provided from asteroid MD33 to be exact.

The shuttle mission was launched in a northerly direction in order to match the polar orbit of the ISS, a move taken two years earlier from which the station could view

Reuters News Service (21 March 1996); "US Approves New Arms Sales to Taiwan" *Reuters News Service* (20 March 1996); "China Warns US to Keep Away from Taiwan Strait" *Associated Press* (17 March 1996); "Asia Shudders as China Rattles Sabers at Taiwan" *Associated Press* (12 March 1996). In fact, tensions had been growing at least since 1979 with the passage of the US "Taiwan Relations Act" which established the following as US policy goals: (1) provision of arms of a "defensive nature," and (2) maintenance of US capacity to resist the resort to force against Taiwan. P.L. 96-8.

⁴⁰ US/Taiwanese space cooperation went back for decades. On 26 January 1999, the US launched Taiwan's very first spacecraft. The 882 pound (401 kg), \$100 million Rocsat-1 (Republic of China Satellite-1) served as a telecommunication relay station as well as housing an ionospheric plasma experiment. See C. Covault, "Athena Fires Taiwan's Satellite Into Space" *AW&ST* 150:5 (1 February 1999) 67.

⁴¹ For years, plutonium 238 has been a preferred nuclear power source, largely because of its long 87.5 year half-life. That is, it would take 87.5 years for one half of the fuel's nuclei to decay. The find on MD33 was particularly significant for the US because late-twentieth century changes in the US nuclear weapons program decreased the production of the substance. See, e.g., R.G. Lange, "A Tutorial Review of Radioisotope Power Systems" in M.S. El-Genk, ed., *A Critical Review of Space Nuclear Power and Propulsion 1984-1993* (New York: American Institute of Physics, 1994) 5.

the entire earth surface. As the vehicle gained altitude, Chinese scramjets⁴² downed the spacecraft just after it allegedly crossed into Chinese airspace some 10 kilometers off its eastern coast. Aggravating the incident and causing international expressions of outrage was the fact that the craft carried not only civil and military space personnel headed for scientific experimentation, but also 12 American and Japanese tourists as well.⁴³

This illegal shooting was the catalyst for the war of 2031. Though international law would not have permitted the vessel to breach territorial airspace without China's permission, China had long since ratified Article 3 *bis* as an amendment to the Convention on Civil Aviation (the "Chicago Convention").⁴⁴ This amendment specifically prohibited the use of weapons against civil aircraft, though the US space shuttle still had not been classified by legal definition as either "spacecraft" or "aircraft." Although the transport in question was capable of aerodynamic flight, and was thus technically an "aircraft" under the Convention, the Chinese maintained that at the moment of impact, the transport had just left earth's atmosphere, was no longer capable of aerodynamic flight, and was therefore no longer an "aircraft." The Chinese further maintained that the vessel was simply a "state" aircraft masquerading as a "civil" aircraft and that therefore it was further deprived of any protection for civil aviation afforded by

⁴² Though widely used in the West for years, hypersonic air-breathing scramjets finally entered the Chinese military arsenal the early 2020s. NASA began design of scramjets for civil use at the Langley Research Center in the 1970s. It later translated this technology into the experimental X-43A, which flew to speeds of Mach 10 in 2004, that is, at 10 times the speed of sound. Development of scramjet technology for military purposes began in 1998. See "Air Force Awards Scramjet Engine Work to P&W" *Mil. Space* (16 February 1998) 2. This scramjet capability was developed on the heels of "ramjet" technology, so-called for the process of "ram" compression used at supersonic speeds to avoid the need for jet turbines. The US has used ramjet technology since the 1940s for its Navaho missiles (D. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership*, rev'd ed. (Colorado Springs, CO & Montgomery, AF: AFSPC & Air University Press, 1998) at 21), and since 1959 for its A-11 and A-12 (later SR-71) reconnaissance aircraft (W.E. Burrows, "The Oxcart Cometh, And Goeth at Mach 3.2" *Air & Space* 13:6 (February/March 1999) 65 at 68). The newer "scramjet" technology (lit. "supersonic-combustion ramjet") had several advantages over older earth-to-orbit delivery systems. It required less propellant than rocket systems (fuel, but no oxidizer), and it was safer since scramjets could maneuver aerodynamically. See C.R. McClinton, "Air-Breathing Engines" *Scientific American* 280:2 (February 1999) 84. Though capable of achieving orbital velocity, the Chinese were still using their scramjets in conventional fighter roles.

⁴³ Respectable sources were reporting even in 1999 about various plans to construct space resorts. "The Space Transportation Association, an industry lobbying group, recently created a division devoted to promoting space tourism, which it sees as a viable way to spur economic development beyond earth." T. Beardsley, "The Way to Go in Space" *Scientific American* 280:2 (February 1999) 81. See also W.B. Scott, "Studies Claim Space Tourism Feasible" *AW&ST* 146:14 (7 April 1997) 58.

⁴⁴ See, e.g., "Responses of States to Council Resolution of 9 June 1997 on Article 3 *Bis*" International Civil Aviation Organization Legal Commission Working Paper, A32-WP/20, 8 September 1998. China's ratification came on 23 July 1997.

the Chicago Convention and its amendments.⁴⁵ Preoccupied with global war, the international community gave up the search for legal resolution of the incident.

Of course, many additional factors contributed to the war as well. Just the previous year, suspicions abounded that the Iranian "meteorological satellite" which exploded and destroyed a nearby US reconnaissance system, was no accident. Though years before this the USSR had perfected the art of destroying spacecraft in orbit,⁴⁶ this was the first suspected combat test of anti-satellite technology by the Chinese.⁴⁷ The real question was not how the explosion occurred (the US intercepted the Chinese destruct command), but rather, how the satellite got so close to the classified US system in the first place. Unlike many other low earth orbit remote sensing satellites, this one had genuine tactical military value. US military and intelligence analysts were far more troubled by elusive answers to the latter question, than by the loss of the \$10 billion system.⁴⁸

Following the downing of the ISS transport spacecraft, the outbreak of hostilities came within days. The first space targets by the Chinese, ominously, were the US missile warning satellites, followed closely by the Global Positioning System, military communications systems in GEOs, and reconnaissance systems in LEOs. For unknown reasons, the Chinese spent inordinate time and resources attempting to *destroy* US satellites. Although the Chinese ASATs achieved several kills, this proved to be a costly preoccupation as redundant U.S. systems were generally able to disrupt Chinese military missions without expending the additional costs of destroying the Chinese space assets.

⁴⁵ By its terms, the convention "shall be applicable only to civil aircraft, and shall not be applicable to state aircraft." Article 3(a). The Convention does not define "state" aircraft, but does suggest that the term is determined functionally by looking to the *use* of the aircraft such as those in "military, customs and police services." Article 3(b).

⁴⁶ See, e.g., "Satellite Explodes" *AW&ST* (15 March 1993) 27. Further, in 1997, Russian President Boris Yeltsin formally acknowledged in a private letter to President Clinton that the Russians had an anti-satellite capability previously, but had "renounced" it. B. Gertz, "Yeltsin Letter Reveals Anti-Satellite Weapons" *Washington Times* (7 November 1997) 1. This same article quoted General Howell Estes, then commander, USSPACECOM, as claiming to have seen information on the anti-satellite capability of other nations as well. General Estes could well have seen evidence of Russian work into new ASAT technology. For information on the Russian resumption of ASAT testing in 1999, see *infra* note 194 and accompanying text.

⁴⁷ As had the Russians, the Chinese had been studying ASAT technology for years. A 1998 Pentagon report expressed the likelihood that China was developing a laser ASAT. Associated Press, "China Building ASAT Laser" *The New York Times* (28 November 1998) 1.

⁴⁸ Decreasing competition and technological advances sent the price of reconnaissance systems extremely high. The \$600-\$800 million price tag for a Vortex-class satellite in 1998 seemed like ancient history in 2030. See "U.S. Rocket Carrying Spy Satellite Explodes After Liftoff" *New York Times* (13 August 1998) 1.

Western debates over strategic missile defense had long since been resolved. Although space-based laser systems in 2031 lacked the precision of their ground based cousins, they were generally superior to the airborne lasers. These space-based systems were used widely by both sides, not only for destruction of objects in flight such as missiles, aircraft, and satellites, but also against ground facilities. Some of these targets contained no military value. The West grew increasingly fearful particularly of the Russian military space systems, which passed over US, Canadian, French, British, and German soil every 90 minutes. These fears were confirmed as Eastern powers began to target the West's national assets – military, civilian, cultural, anything of the remotest military or morale-defeating value. This was, as the Eastern propaganda machinery reiterated again and again, total war.⁴⁹ Raging debates in the West were finally won by the those advocating response in kind. Soon, it was impossible to separate the criminal acts from the justifiable reprisals.

⁴⁹ “[W]ar without limits, moral, practical, or geographical.” T. Powers & R. Tremain, *Total War: What It Is, How It Got That Way* (New York: William Morrow and Company, 1988) at 11.

Chapter Two: The Military Ascent to Space

We will engage terrestrial targets someday – ships, airplanes, land targets – from space. We will engage targets in space, from space. . . .[the] missions are already assigned, and we've written the concepts of operations.⁵⁰

General Joseph W. Ashy, USAF (1996)

The foregoing scenario presents numerous legal issues, the resolution of which will occur only after further evolution of relevant international norms.⁵¹ Nonetheless, as is apparent, many of the conditions referenced in the scenario have their roots in current events – events with a well-documented history. In most respects, the history of mankind's ascent to space is a history of the militarization⁵² of outer space. A review of this history, along with a basic familiarization of current and potential implements of space warfare, provides the requisite context from which the analysis herein can proceed to legal considerations related to the weaponization of space. Among other things, an

⁵⁰ Former Commander, USSPACECOM. Quoted in W.B. Scott, "USSC Prepares for Future Combat Missions in Space" *AW&ST* (5 August 1996) 51. Providing another in a series of observations on the military "operationalization" of outer space, General Ashy later predicted that "the relatively high percentage of space force capabilities devoted to a supporting role will change to a 'supported' role. In other words, future military operations will be supported not only *from* space (as in the first stages of airplane use), but also within and to space." J.W. Ashy, "Space Operations and Organization: Some Thoughts About the Future" *AW&ST* 146:16 (16 April 1997) 56.

⁵¹ Any attempt to depict the future in plausible terms is fraught with many challenges. The following three, taken from a fascinating US Air Force study on future concepts, capabilities, and technologies in the year 2025, certainly apply to any attempt to envision a future law of war and the conditions necessitating it: "First, one runs the risk of assuming that because we *can* do something, we *will*. In this case technology drives planning, not the reverse. Second, we straight-jacket the future with today's assumptions. That is, we focus on an array of problems and possibilities that are too narrow compared to the array we actually will encounter. A third problem is the reverse of the previous one. Here, we are too expansive and imagine far more than we or the world are in fact capable of accomplishing in the time frame under review." J.W. Kelly, "Executive Summary" in *Air Force 2025* (Montgomery, AL: Air University Press, 1996) 6, online: Air University Homepage <<http://www.au.af.mil/2025/monographs/E-S/e-s.htm>> (date accessed: 3 July 1999) [hereinafter *Air Force 2025*].

⁵² The term "militarization," as applied to outer space, should not be confused with "weaponization." Though there are no authoritative definitions of either term, the former refers to "the use of outer space by a significant number of military spacecraft." I.A. Vlasic, "Space Law and the Military Applications of Space Technology" in N. Jasentuliyana, ed., *Perspectives on International Law* (London: Kluwer Law International, 1995) 386, n.6 [hereinafter Vlasic, "Space Law and Military Applications"]. Such activity may be non-aggressive and scientific in nature, or aggressive and hostile. It may or may not involve the use of weapons, though the contrasting term "weaponization" is meant to suggest that by itself, the term "militarization" as applied to space does not include the presence of weapons. The term weaponization "refers to the placing in outer space for any length of time any device designed to attack man-made targets in outer space and/or in the terrestrial environment." *Ibid.* Though not necessarily so, the term implies the

understanding of technical space developments provides insight into the way international legal norms have developed. As discussed more fully in Chapter Four, while the means by which States may lawfully attack each other's assets and personnel within space remains partially proscribed, the law has condoned the non-aggressive military use of space for decades.

A. Origins and Evolution of Space Militarization

1. Missiles and Rockets

Space warfare, as any other use of outer space, requires access to the space environment. That access requires the use of missiles and rockets, later termed "boosters" in view of their utility as launch vehicles for spacecraft. As for most other segments of space technology, rockets⁵³ were first developed for use by military forces. Matte notes the likelihood that "as early as 3000 B.C. the Chinese had developed rockets for, among other things, use in warfare."⁵⁴ It would be almost 5000 years however before rockets became a major instrument of warfare. At the beginning of the twentieth century, few observers could have imagined the breakthroughs in rocket technology the century would hold. During World War I (WWI), the standard long-range weapon was the artillery. Between the world wars however, much effort went into extending the size and range of artillery-type weapons. Though the necessary propellants and guidance technology existed for rockets to be put to military uses in the 1930s, the US for one did

maintenance and use of such weapons by military forces. Thus, though conceptually distinct, weaponization should generally be conceived as a form of militarization.

⁵³ Rockets can be distinguished from missiles essentially in that the latter possess superior navigational technology, making them more accurate for striking targets. Otherwise, the following definition of "rocket" could apply to both: "A vehicle that can operate outside Earth's atmosphere, because it carries its own oxidizer, as well as fuel." Collins, *supra* note 25 at 159-160.

⁵⁴ N.M. Matte, *Space Activities and Emerging International Law* (Montreal: McGill University, Center for Research of Air and Space Law, 1984) at 13 [hereinafter Matte, *Space Activities*]. Matte further observes that "[m]ilitary use has given the greatest impetus to modern rocket technology." Durch and Wilkening trace the rocket's history as follows: "The military rocket is a device whose pedigree is obscure. Though many credit the Chinese with their first use in the thirteenth century, there is some indication that the formulae for the propellants used in those rockets may have come to China from Europe. On the other hand, the Mongol expansion of the middle thirteenth century may have transported Chinese technology westward. That same expansion brought rocketry to India, where it was encountered by the British as early as 1750. Indian war rockets were used primarily to spook cavalry (in effect, as early jamming devices), and at that they were apparently effective." W.J. Durch & D.A. Wilkening, "Steps Into Space" in W.J. Durch, ed., *National Interests and the Military Use of Space* (Cambridge, MA: Ballinger Publishing Company, 1984) 17 [hereinafter Durch & Wilkening].

not express sufficient interest to invest effort and funds in the development of rocketry.⁵⁵ That role fell to Hitler's Germany.

Around the turn of the century, a Russian scientist published his theories on advanced space flight which included the first technical specifications for staged rocket propulsion. Though largely unknown outside of Russia during his lifetime, Eduardovich Tsiolkovsky "worked out the theory of a liquid-fueled rocket dependent on kerosene to achieve sufficient exhaust velocity."⁵⁶ Forming one-third of what space historian David Spires calls the "space triumvirate,"⁵⁷ Tsiolkovsky was soon joined in the technical quest for spaceflight by Germany's Hermann Oberth and America's Robert Goddard. Of the latter two, Oberth became the "publicist for rocketry" with publication of his 1923 pamphlet "The Rocket into Interplanetary Space," which introduced for enthusiastic European audiences the possibility of space exploration. Goddard, unlike his colleagues, "immediately moved beyond theoretical studies to practical experimentation."⁵⁸ Of the three visionaries, Oberth's theories found the earliest wartime application, as they were seized-upon by the German military.⁵⁹

It was German ingenuity that first applied rocket technology to large-scale military combat use.⁶⁰ At the Peenemunde experimental site on the Baltic coast,

⁵⁵ Durch & Wilkening, *ibid.*

⁵⁶ D.N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership*, rev'd ed. (Colorado Springs, CO & Montgomery, AL: Air Force Space Command & Air University Press, 1997) at 5 [hereinafter Spires].

⁵⁷ *Ibid.*

⁵⁸ *Ibid.* It is for this reason that Goddard is widely regarded as the "father" of modern rocketry.

⁵⁹ German rocket specialists, including Werner von Braun, who later masterminded the US rockets sending astronauts to the Moon, freely admitted their debt to Goddard's applied research however. *Ibid.* at 6. After coming to the US, von Braun declared that he was "virtually overwhelmed by the thoroughness of [his] work [and] found that many design solutions in the [German rockets] were covered by Goddard's patents." Heppenheimer, *infra* note 62 at 33. In fact, it is Goddard that is often credited with the title "father of modern rocketry" following the publication of his 1920 paper "A Method of Reaching Extreme Altitudes." *Ibid.* at 30. However, his modesty seems to have prevented him from a wider audience. "In his lifetime Goddard was a prophet with only modest honor, for he rarely addressed meetings of technical societies and published very little." *Ibid.* at 33.

⁶⁰ Spires points out that following WWI, Germany was interested in bombardment rockets for its army that was "sorely constrained by the Versailles Treaty." Spires, *supra* note 56 at 5. Although the Treaty of Versailles effectively disarmed Germany by forbidding the development of heavy artillery and poison gas, it did not constrain all potential weapons such as the rocket. In 1919, few thought of it as practical weapon of war. Durch & Wilkening, *supra* note 54 at 17. Following the Nazi rise to power in the early 1930s the Treaty was repudiated outright. However, the research into military rocketry continued as the merits of the potential weaponry became clearer.

Germany constructed the famous V-2 ("Vergeltungswaffe Zwei") rocket.⁶¹ Making its first flight in October of 1942,⁶² the rocket stood over 13 1/2 meters high, weighed 15,300 kg, had a range of 322 km,⁶³ and was propelled by an engine producing 800,000 horsepower.⁶⁴ The rocket used a turbo fuel pump generating pressure at 300 pounds per square inch while pumping 50 gallons (189.5 liters) of fuel per second.⁶⁵ For guidance and control, the most difficult technical feat, the rocket relied on gyros that only partially compensated for wind and other destabilizing factors in flight. Nonetheless, the V-2 represented a fearsome weapon to which there was no known defense. It also ushered in one of the most significant revolutions in military weaponry.⁶⁶

Following the war, under "Operation Paperclip" many German rocket scientists were captured for further work in the US.⁶⁷ With their expertise, the US began reconstructing the essence of V-2 technology for the development of more advanced rockets. This work, together with experience gained from the 1930s and 1940s studies and experiments at the California Institute of Technology under Dr. Theodore Von

⁶¹ In popular parlance, the "V" stood for "vengeance" and the "2" represented the second rocket-type fielded by the German army. The first model, the much smaller V-1, was produced by the German Luftwaffe as an aerodynamic pulse-jet "cruise" missile. Although the big rocket was known to technical specialists as the A-4, V-2 is the more common designation that is familiar to most observers of the German rocket program (the "Wehrmacht" program). The V-2's three predecessor models began in 1933 with the A-1 (later described by German scientist von Braun as taking 1 1/2 years to build and 1/2 second to blow up, Heppenheimer, *infra* note 62 at 15), and ended in 1936 with the A-3.

⁶² T.A. Heppenheimer, *Countdown: A History of Space Flight* (New York: John Wiley & Sons, Inc., 1997) at 4 [hereinafter Heppenheimer].

⁶³ Spires, *supra* note 56 at 5.

⁶⁴ Heppenheimer, *supra* note 62 at 22.

⁶⁵ *Ibid.* at 23. For this purpose, the German scientists used modified firefighter's pumps which also required simple construction, fast action, very high flow rate, and constant delivery pressure.

⁶⁶ Indeed, Wernher von Braun termed its capture by the US "one of the greatest technical prizes in history." von Braun & Ordway, *infra* note 74 at 117.

⁶⁷ The effort was necessary in response to German attempts to destroy all vestiges of the program, as recounted in the following passage: "[In 1945] the Soviets captured Peenemunde. The United States Army occupied the Harz Mountains, capturing the Central Plant. Just prior to this, about five hundred of the key guided-missile personnel and technicians were taken south of Munich by SS troops to be executed rather than to allow their being captured. The movements of the Allied forces were so rapid that Nazis did not get time to carry out their plan. On March 15, 1945, orders were received from SS headquarters to remove and hide all documents to prevent their capture. Two members of the Peenemunde group carried out these orders by loading all available material on three large trucks and trailers and taking it to an abandoned mine in the Harz Mountains. The documents were unloaded in the mine, and the entrance was blasted shut. Their efforts were in vain. By the end of April, 1945, United States Army units located the mine and found the hidden documents. [Thereafter,] approximately one hundred and fifty of the engineers, scientists, and technicians were rounded up and offered five-year contracts to bring their missile know-how to the United States." M. Stoiko, *Soviet Rocketry: Past, Present, and Future* (New York: Holt, Rinehart & Winston, 1970) at 70-71 [hereinafter Stoiko].

Kármán, contributed to Project MX-774 – later to become the Atlas missile, a research and development effort aimed at creating a 5,000 mile range intercontinental ballistic missile.⁶⁸ General Henry Arnold, chief of the US Army Air Corps just prior to its establishment as the US Air Force in 1947, predicted that such a weapon “is ideally suited to deliver atomic explosives, because effective defense against it would prove extremely difficult.”⁶⁹ Little did General Arnold know that such defenses would continue to prove extremely difficult through 1999 and beyond.⁷⁰

In the US, missile research and development competed directly for precious funding with long range bombers. “As with satellite proposals, initial postwar interest in long-range guided missiles soon succumbed to an Air Force policy that relied on strategic bombers carrying air-breathing missiles, ...”⁷¹ Nonetheless, missile advocates kept sufficient interest engaged to fund development of the Redstone, Jupiter, and Juno missile programs under the US Army’s Redstone Arsenal.⁷² In addition to various sounding rocket⁷³ and cruise missile programs,⁷⁴ and the Thor IRBM, improvements to the original

⁶⁸ M.J. Muolo, *Space Handbook: A War Fighter’s Guide to Space*, vol. I (Montgomery, AL: Air University Press, 1993) at 3 [hereinafter Muolo, vol. I]. Although the US cancelled the project in 1947, it was reinstated in 1951 and has “changed little in over 40 years. ... Significant advances in its capability and adaptability are reasons the Atlas has become the ‘DC-3’ of space launch vehicles.” *Ibid.* at 126-127.

⁶⁹ Quoted in Spires, *supra* note 56 at 10.

⁷⁰ For a discussion of missile defense and the legal regime regulating it, see *infra* notes 542 through 548 and accompanying text.

⁷¹ Spires, *supra* note 56 at 17. Until the early 1950s, the early missile advocates were forced into a form of circular reasoning: “missiles seemed too challenging technologically, but no funds could be spent on solving the technological dilemmas; so the problems would go unresolved and the missile would remain ‘impossible.’ To questions about the logic of budgeting for missile programs, the answer always seemed to be the dogmatic response: ‘the time is not right’ for an expanded program.” *Ibid.* at 21.

⁷² At least four factors account for the change in attitude by the US: first, news that the Soviets had successfully detonated an atomic bomb in August 1949; second, communism’s triumph in China; third, reports of Soviet advances in missile technology; and fourth, the outbreak of the Korean war in June 1950. *Ibid.* at 22-23.

⁷³ Examples include the WAC Corporal, Aerobee, and Viking. Of these, the WAC Corporal became “the first man-made object to enter extra-terrestrial space” having been launched as a second stage from a V-2 to a height of 250 miles. *Ibid.* (quoting F. Malina’s paper “Origins and First Decade of the Jet Propulsion Laboratory” at 60).

⁷⁴ Early cruise missiles included the Snark, the first intercontinental cruise missile, and the Navaho. The latter traveled to its target under ramjet power, see *supra* note 42, achieving speeds in excess of mach 3. In the years following WWII, the threat of nuclear exchange made the small, slow cruise missiles ineffective as an intercontinental delivery system as compared to ballistic missiles. “The ICBM’s can travel thousands of miles along arcs that take them hundreds of miles out into space; their trajectories, once determined during the interval that the motors are in operation, are thence affected only by gravitational forces and by air resistance during their exit from and re-entry into the atmosphere.” W. von Braun & F. Ordway III, *History of Rocketry and Space Travel*, 3rd rev’d ed. (New York: Thomas Y Crowell Company, 1975) at

V-2 design soon lead to the first operational US ICBM – the Atlas.⁷⁵ Within a few years, the US fielded the even larger and more sophisticated Titan missile,⁷⁶ evolved versions of which are still widely in use today both as ICBMs and commercial space boosters.⁷⁷

Following World War II, the Soviet Union captured its share of German scientists as well. Using the V-2 as its point of departure, the USSR did more than simply build copies of the weapon, it put the rocket back into production within the Soviet zone of occupation in Germany.⁷⁸ Unlike the US, the Soviet Union did not have a huge fleet of long-range bombers, thus the prospect of ICBM development did not have the same bureaucratic obstacles from a competing weapons platform. What it did have were relatively primitive atomic weapons that were bulky, and required tremendous lift to propel them across an intercontinental range. They proceeded to create just such heavy-

121 [hereinafter von Braun & Ordway]. Cruise missiles could not compete with this capability for intercontinental application.

⁷⁵ The Atlas contained significant performance enhancements that allowed for it to leave Earth's atmosphere and then send an independent warhead back to earth. These included housing its liquid fuel within the rocket's skin, and making the warhead separable from the rocket so the latter could avoid the design features requiring survivability upon reentry.

⁷⁶ The Titan was originally conceived as a "backup" program to the Atlas. The two programs were developed simultaneously in order to save time in countering the increasing perception of Soviet missile superiority. In 1953, Assistant Secretary of the Air Force for Research and Development, Trevor Gardner, became the champion of ICBM development in the US having "made it his mission in public life to convince the government that the nation must pursue a crash program to develop an operational Air Force ICBM or face nuclear disaster." Spires, *supra* note 56 at 31. Gardner's technological evangelism proved so successful, that by the fall of 1955, President Eisenhower designated the Atlas ICBM the "highest national priority" weapons system. *Ibid.* at 35. Management for the crash missile program fell to Gardner protégé Brigadier General Bernard Schriever, a man who "used his intelligence, patience, and superb negotiating skills with military, government and private industry leaders to become an effective advocate for missile and space systems causes." *Ibid.* at 33.

⁷⁷ The complete "family" of Titan missiles includes the following versions: I (1959); II (1962); Gemini (1965); IIIA (1964); IIIB (1966); IIIC (1965); IIID (1971); IIIE (1974); 34B (1975); 34D (1982); IISLV (1988); III (1989); IV (1989). P. Clark, *Jane's Space Directory*, 13th ed., 1997-1998 (Surrey, England: Jane's Information Group, 1997) at 277 [hereinafter *Jane's*]. In addition to the Atlas and Titan missiles, the DoD uses a variety of other missile systems, principally as spacelifters rather than weapons systems, including the SCOUT, Pegasus, Delta, and Space Transportation System ("Space Shuttle"). Muolo, vol. I, *supra* note 68 at 121-134. Additional missiles developed since WWII for weapons use include the Polaris and Poseidon (both sea-launched), Pershing, and the Minuteman.

⁷⁸ Heppenheimer, *supra* note 62 at 60. Though the US got to Germany first, the Soviets were first to Peenemunde. Nonetheless, by the time they got there, most of the documents and personnel had been removed by the Nazi SS. Still, there was enough left for the Soviets to use productively, including middle and lower-level staffers familiar with the V-2 rocket research and development. Though the codename "Operation Paperclip" for the US roundup of German scientists, documents, and hardware was revealed after the war, as was the British "Operation Backtrack," the Soviet codename was never made public. Stoiko, *supra* note 67 at 71.

lift launch vehicles.⁷⁹ The first Soviet ICBM, bearing the designation "SS-6," was launched in August 1957, a full fifteen months before the first Atlas launch. It was an SS-6 that carried the world's first satellite, Sputnik I, into orbit on 4 October 1957.⁸⁰

2. Nuclear Devices

Following the advent of rocketry, creating a weapon of ultimate destructive capability was just a matter of time for the leading scientific minds. The conventional explosives used by the V-2 rockets simply mimicked the effects attainable by means of air-dropped bombs. These contained the equivalent of 1 ton of TNT. By contrast, the earliest nuclear weapons contained the equivalent of 20,000 tons (20 kilotons).⁸¹ Later versions would deliver the equivalent of 15,000,000 tons (15 megatons) of TNT and

⁷⁹ The implications from this early Soviet resolve were enormous. As von Braun later observed, "[t]he decision [to proceed with the ICBM before the US] not only gave [the Soviets] a significant edge in ballistic missile technology for years, but was also a great factor in their leadership in space exploration." von Braun & Ordway, *supra* note 74 at 140.

⁸⁰ The first US satellite, Explorer 1, was launched atop a Juno 1 on 31 January 1958. See *ibid.* at 160.

⁸¹ D. Langford, *War in 2080: The Future of Military Technology* (New York: William Morrow & Company, 1979) at 45 [hereinafter Langford]. The first large-production nuclear weapon utilized a chain-reaction process known as fission, by which the mass of a uranium or plutonium atom is converted to energy. In the US, the military "Manhattan Project" discovered that of the two uranium isotopes, U-235 and U-238, only the former was suitable for weaponry, though it was far less prevalent in nature. Manhattan Project scientists observed that when a U-235 atom absorbs a neutron it becomes for an instant a highly unstable U-236 atom. This sets in motion the atomic process known as fission. "Almost instantly, the U-236 nucleus flies apart into two smaller and more stable nuclei, ... If the piece of U-235 involved is small, the fission neutrons may escape; if it's sufficiently large (above 'critical mass'), they're more likely to strike other U-235 nuclei which explode in their turn. The chain reaction can grow exponentially ... until so much energy is released that the original lump of U-235 is vaporized. ... [In order to achieve critical mass, the shape of the material matters greatly.] A sphere is the best shape of all, having the minimum surface (leakage) area for its volume and needing the smallest amount of U-235. ... Since a critical mass will go off of its own accord, triggered by spontaneous fission or by a stray neutron from the air, it is also necessary to prevent criticality from being reached until the right moment. The chain reaction is then encouraged with a flood of 'priming' neutrons from some external radiation source. ... [However,] the very energy of the chain-reaction has a strong tendency to break up the reacting system *before* a true nuclear explosion can develop. Thus a bomb must use violent measures to force its fissile material into supercriticality and hold it in place while the enormous heat of the reaction builds up." *Ibid.* at 43-45. Langford notes that as between uranium and plutonium, the latter is easier to use for fission weaponry. *Ibid.* at 47. The nuclear weapon dropped on Hiroshima on 6 August 1945 ("Little Boy") was a uranium bomb which was remotely detonated at a height of 570 meters over the city. "Detonation height determined how large an area would be damaged ... A bomb detonated too high would expend its energy blasting thin air; a bomb detonated too low would expend its energy excavating a crater. It was better to be low than high ..." Rhodes, *infra* note 83 at 631. On 9 August 1945, a plutonium bomb ("Fat Man") was dropped on Nagasaki with an estimated 22 kiloton yield.

more.⁸² US President Truman would write in his personal diary, “we ‘think’ we have found a way to cause a disintegration of the atom.”⁸³

These early devices weighed five tons and required a rocket of several hundred tons to carry one weapon to Moscow – too heavy to be practically effective.⁸⁴ However, with the advance of the ICBM came the advance of the nuclear device. It soon became small enough to launch inside the nose-cone of a rocket.⁸⁵ Thus, the lightening speed of the rocket was mated to the overwhelming power of the nuclear weapon. And given its desirability for military advantage, it also proliferated.

Between 1945 and 1992, the United States went on to manufacture a total of 70,000 nuclear weapons, some 10,500 of which are still in service. The Soviet Union produced 55,000, of which 15,000 are currently active. Britain reportedly made 834 nuclear warheads, France 1,110 and China 600. According to various reports of unknown reliability, Israel may have made 200, India twenty, Pakistan between four and seven. South Africa admitted it had produced six devices before giving up its programme; North Korea may have one or two.⁸⁶

⁸² Langford, *supra* note 81 at 49. It bears repeating that “nuclear” weapons are those characterized by the unique interaction of particles within an element’s *nucleus*. The process of “enriching” uranium and plutonium to create the suitable isotope lead to a search of easier methods of harnessing the tremendous energy potential of an atomic reaction. The successor to uranium and plutonium fission, was hydrogen fusion. Not only did the necessary isotopes of hydrogen (deuterium and tritium) come much more plentifully in nature, but its mass could be converted to five times more energy than either uranium or plutonium. *Ibid.* at 48. Whereas the fission chain-reaction began with the acquisition of a stray neutron which then spread from nucleus to nucleus, the fusion reaction requires the fusing of two nuclei. Because of the natural magnetic repulsion of hydrogen nuclei, the two must be forcibly fused to begin the fusion reaction. This is accomplished by heating the nuclei to such a degree that their resulting speed yields collisions of sufficient force to achieve the fusion. Thus the term “*thermonuclear*” weapons. The triggering element used to generate the tremendous heat needed for fusion, is a fission reaction. Once the fusion begins, it creates its own chain-reaction. By surrounding the entire explosive core with U-238, scientists discovered that the neutrons lost in the fusion reaction, could be used to fuel a second fission reaction. Thus, the nuclear weapons most widely stockpiled, make use of a fission-fusion-fission process. *Ibid.* at 49. The first thermonuclear device, carrying an explosive force of 10 megatons of TNT was detonated at the Eniwetok atoll in 1952. In 1954, a 15 megaton device was detonated at the Bikini atoll. *Ibid.*

⁸³ Quoted in R. Rhodes, *The Making of the Atomic Bomb* (New York: Simon & Schuster, 1986) 690 [hereinafter Rhodes].

⁸⁴ Heppenheimer, *supra* note 62 at 47. By contrast, the V-2 weighed a mere 14 tons.

⁸⁵ One Minuteman III ICBM is armed with the equivalent of 84 first-generation nuclear weapons. Rhodes, *supra* note 83 at photo n. 106.

⁸⁶ D. Shukman, *Tomorrow’s War: The Threat of High-Technology Weapons* (New York: Harcourt Brace & Company, 1996) at 25 [hereinafter Shukman].

It was not until 1957 that the first nuclear detonations occurred in space.⁸⁷ Not only did this development become a catalyst for passage of a treaty limiting nuclear weapons testing (Limited Nuclear Test Ban Treaty),⁸⁸ but it brought a plea from the Soviet Union that such tests not endanger the safety of Soviet cosmonauts. The US responded to the Soviet concern with the assurance “that no activities were contemplated which could have harmful effects upon the Soviet spacemen.”⁸⁹ Following passage of the Limited Nuclear Test Ban Treaty in 1963, such detonations in space were no longer lawful and simple verification measures made them easily detected.⁹⁰

3. Satellites

In many ways, the evolutions of satellite technology follows the evolution of missile technology. Without the latter, the former had no way of reaching outer space. Thus, the early battles for funding of satellite technology in the US DoD and in Congress, often pitted satellite and missile research against conventional weaponry.⁹¹ Once funding for ICBMs came through however, it was soon realized that rockets more powerful than an ICBM might succeed in launching satellites.⁹²

⁸⁷ A Tass new agency announcement of 27 August 1957 which reported the successful test of the Soviet ICBM also included reference to “a series of explosions of nuclear and thermonuclear (hydrogen) weapons ... set off at great altitudes.” Quoted in M.S. McDougal, H.D. Lasswell & I.A. Vlasic, *Law and Public Order in Space* (New Haven, CT: Yale University Press, 1963) at 389, n.77 [hereinafter McDougal, Lasswell & Vlasic]. Between 27 August 1957 and 7 September 1958, the US exploded three atomic bombs over the South Atlantic at a reported altitude of between 200 and 300 miles. During the summer of 1962 in the Pacific at similar altitudes, the US exploded weapons “in the hydrogen bomb range.” *Ibid.* In a 3 November 1958 report to the US President, three possible military uses of a high-altitude nuclear detonation were identified: “The high energy radiation including particles from the explosion produces effects on space; the whirling high energy electrons generate radio noise; and the delayed radiation from the fission products can affect radio transmission.” Quoted in P.B. Stares, *The Militarization of Space: U.S. Policy, 1945-1984* (Ithaca, NY: Cornell University Press, 1984) at 108 [hereinafter Stares, *The Militarization of Space*].

⁸⁸ See *infra* notes 521 through 531 and accompanying text.

⁸⁹ McDougal, Lasswell & Vlasic, *supra* note 87 at 45. The Soviet note and US reply are reprinted in *The New York Times* (12 August 1962) 22.

⁹⁰ The US “Vela Hotel” series of satellites were launched in 1963 and 1964 to scan above the horizon and detect nuclear tests in space. They were, in the view of one military space historian, “one of the most successful Air Force space projects.” C. Peebles, *High Frontier: The U.S. Air Force and the Military Space Program* (Washington, DC: Air Force History and Museums Program, 1997) at 41 [hereinafter Peebles, *High Frontier*].

⁹¹ Spires, *supra* note 56 at 35. In time, “the relationship between satellites and missiles had become better understood as rockets with sufficient thrust soon would be able to launch the heavier satellites. ...”

⁹² Heppenheimer, *supra* note 62 at 90.

Though members of the “space triumvirate” speculated on the possibility of artificial satellites in Earth orbit, Project Rand, under the Douglas aircraft company,⁹³ demonstrated the feasibility of such a feat in its report of 2 May 1946. Report number SM-11827, “Preliminary Design of an Experimental World-Circling Spaceship,” not only provided 236 pages and 8 appendices of detailed technical theory, but it spawned numerous subsequent reports on the feasibility of satellite design, launch, and reentry. In simple terms, the report declared that “[i]f a vehicle can be accelerated to a speed of about 17,000 m.p.h. and aimed properly, it will revolve on a great circle path above the earth’s atmosphere as a new satellite. The centrifugal force will just balance the pull of gravity.”⁹⁴ The report subsequently predicted that “[t]he achievement of a satellite craft by the United States would inflame the imagination of mankind, and would probably produce repercussions in the world comparable to the explosion of the atomic bomb.”⁹⁵

A subsequent Rand study of 1949, entitled “Utility of a Satellite Vehicle for Reconnaissance,” focused attention on the strategic mission a military satellite could have.⁹⁶ It was also anticipated that such a satellite could provide political benefit inasmuch as it could penetrate the secrecy behind the Soviet “iron curtain” and thus affect Soviet conduct. As the Rand report noted, “no other weapon or technique known today offers comparable promise as an instrument for influencing Soviet political behavior.”⁹⁷ Scientific study throughout the 1950s led to development of the first military satellite, designated WS-117L or the Advanced Reconnaissance System, that used an electro-optical television-type imaging system for a reconnaissance capability.⁹⁸ During development of this military capability, the US continued parallel research into the civilian satellite that would become Explorer I, the first US satellite in space launched on 3 January 1958.⁹⁹ “The civilian satellite would serve as a stalking horse to establish the

⁹³ Project Rand later became the Rand Corporation, a federally funded research and development corporation serving as the primary technical consultant to the US Air Force.

⁹⁴ “Preliminary Design of an Experimental World-Circling Spaceship,” from the Abstract, p. II.

⁹⁵ *Ibid.* at 2.

⁹⁶ Spires, *supra* note 56 at 27.

⁹⁷ *Ibid.* at 27-28.

⁹⁸ The Air Force established the “requirement” for such a system on 27 November 1954, followed up by a formal General Operational Requirement in March 1955 which called for a system providing a resolution of no larger than 20 feet. *Ibid.* at 36-37.

⁹⁹ Among other motivations, launch of the highly-publicized civilian satellite was to establish the principle of “freedom of space” for the military satellites to follow. *Ibid.* at 39. As the US President’s science

precedent of 'freedom of space' for the military satellite,¹⁰⁰ but the [US] administration maintained great secrecy on the latter so that attention would remain focused on the former."¹⁰¹

Meanwhile, the Soviet Union had two satellites in orbit before the launch of Explorer I, and a third was launched on 15 May 1958. Disconcerting for the US regarding the second and third Soviet launches was the size of the orbiters the Soviets were able to launch. The second weighed 504 kg and the third 1,327 kg.¹⁰² By contrast, the much-publicized US Vanguard satellite weighed a mere 21.5 pounds (9.5 kg) while the first US satellite in orbit weighed only 11 pounds (5 kg). The contrast between the mass of these satellites sparked concern over the power of the Soviet ICBMs, and prompted a "missile gap" controversy by the end of the decade.

In time, the mission for reconnaissance satellites in the US would be shared between the military and the intelligence establishment. Systems such as the venerable Corona series were launched in early 1959 amid great secrecy and were controlled by the US Central Intelligence Agency.¹⁰³ Though the focus of public US military space activity remained in the Department of Defense, it was determined that reconnaissance missions from space could not be publicized.

Indeed, the Corona program was so sensitive, that it was given the code-name "Discoverer" to establish a cover. The launches were said to contain "a scientific project

advisor saw matters, the scientific satellite had to precede the military satellites to establish the principle. This became a matter of official US policy with President Eisenhower's adoption of National Security Directive 5520 in 1955. *Ibid* at 41. As it turned out, the Soviets established the principle for the US with the prior successful launch of Sputnik I on 4 October 1957. The first US satellite in orbit, Explorer I, did go easily. After failed launches of the principal satellite system, Vanguard, the international press had a field day. The Germans dubbed it "spaetnik" (latenik); the *London Daily Herald* "flopnik"; and the *London Daily Express* "kaputnik." Heppenheimer, *supra* note 62 at 127. The insult was only exacerbated at the United Nations as Soviet delegates "asked their American counterparts if the United States might wish to receive foreign aid under Moscow's program of technical assistance to backward nations." *Ibid* at 128.

¹⁰⁰ Unlike the high seas, no international legal regime existed for outer space in the mid-1950s.

¹⁰¹ Spires, *supra* note 56 at 41.

¹⁰² Peebles, *High Frontier*, *supra* note 90 at 9.

¹⁰³ Launched as a stop-gap measure for strategic reconnaissance between the termination of U-2 high altitude reconnaissance aircraft and the WS-117L system, the Corona system remained operational from its first flight on 28 February 1959 through June 1972. The Air Force was nominally deemed a joint venture partner of the program which required mid-air recovery of film imagery taken by the orbiting camera. For a thorough account of the recently-declassified Corona program, see C. Peebles, *The Corona Project: America's First Spy Satellites* (Annapolis, MD: Naval Institute Press, 1997) [hereinafter Peebles, *The Corona Project*].

that conducted biomedical research and other experiments in space.”¹⁰⁴ As Corona began collecting Soviet imagery, WS-117L was renamed Sentry and then SAMOS (for Satellite and Missile Observation System), before its first launch. Under President Eisenhower, the DoD established the Office of Missile and Satellite Systems with oversight for all national reconnaissance activities, later to become the National Reconnaissance Office (NRO). Eisenhower’s successor, President Kennedy, perpetuated these basic organizational changes, including safeguarding the very existence of the NRO as a state secret.¹⁰⁵ Indeed, under the Kennedy administration “the words ‘SAMOS’ and ‘Discoverer’ disappeared from public statements and the US government no longer acknowledged that satellites were used for reconnaissance – a policy that remained in effect until 1978.”¹⁰⁶

Despite its continuing protection of national security matters, the NRO has recently revealed some of its methods and assets, including a \$1.5 billion (US) state-of-the-art Lacrosse imaging satellite.¹⁰⁷ The 15 ton, school bus-sized satellite was developed in 1986 to track the movement of Warsaw Pact weaponry. Producing images to resolutions of 1 meter, the system uses radar technology to obtain images through clouds, foliage, or darkness.¹⁰⁸ As of 1997, the NRO maintained two Lacrosse satellites on-orbit with two more planned. In addition to these, the NRO maintains the HK-11 (“Keyhole”) satellite system which, using optical sensors, is reported to produce resolutions of 6 to 12 inches (15 to 30 cm).¹⁰⁹

¹⁰⁴ Peebles, *High Frontier*, *supra* note 90 at 13.

¹⁰⁵ “Its existence was considered so secret that even in classified documents outside the special security controls established for satellite photos and data, the words ‘National Reconnaissance Office’ and ‘National Reconnaissance Program’ were not to be used. Instead, the phrase ‘Matters under the purview of DoD TS 5105.23’ would be given. (This was the directive which established the NRO.) It would be thirty-two years before the initials ‘NRO’ were spoken in public by a U.S. government official.” Peebles, *The Corona Project*, *supra* note 103 at 96.

¹⁰⁶ Peebles, *High Frontier*, *supra* note 90 at 14.

¹⁰⁷ Upon release of videotape depicting the satellite, *Aviation Week & Space Technology* declared that it used “the most advanced technology employed by any U.S. military or civilian unmanned spacecraft.” C. Couvalt, “Secret Relay, Lacrosse NRO Spacecraft Revealed” *AW&ST* 148:12 (23 March 1997) 26 at 27.

¹⁰⁸ *Ibid.* With its solar array and still-secret radar antenna, the satellite is actually much larger than a bus.

¹⁰⁹ *Ibid.* at 28. For obvious reasons, military technology exceeds that which is commercially available. This continues to challenge military research and development however with ever-increasing improvements to commercial remote sensing capability. In April 1999, the Space Imaging Corporation was set to exceed Russia’s Spin-2 capability of 2 meters. The Ikonos 1 satellite boasts digital black and white images to resolutions of 1 meter. M. Mecham, “Commercial Imaging to Enter 1-Meter Era” *AW&ST* 150:17 (26 April 1999) 84. After launch on 27 April 1999, the satellite was lost when an electrical malfunction

Reconnaissance was not the only military mission for early satellites. Almost simultaneously with WS-117L, and indeed as an outgrowth of it, the US military was developing a missile warning system to monitor the launch of Soviet ICBMs. The first such program, MIDAS ("missile detection and alarm system"), was troubled with false alarms and overall system unreliability virtually from its operational beginning in 1960.¹¹⁰ Despite some successful test detections, the system was replaced in the early 1970s by geosynchronous satellites of the Defense Support Program (DSP) which proved to be "highly successful," offering the US President notice of a missile attack within moments of launch.¹¹¹ Using an advanced infrared telescope mounted to the spacecraft's front end, the DSP telescope remained focused on Earth ready to generate an electronic signal upon detection of a missile launch. Its use continues today.¹¹²

Beyond these, other significant satellite systems were developed to carry military communications,¹¹³ to provide weather intelligence,¹¹⁴ and to aid navigation. Though

prevented the satellite to separate from its booster. "Athena/Ikonos Loss Caused by Open Circuit" *AW&ST* 150:24 (14 June 1999) 82; C. Covault, "Reviews Advance As New Satellite Fails" *AW&ST* 150:21 (24 May 1999) 61.

¹¹⁰ MIDAS was originally designated "Subsystem G" in the WS-117L program before becoming its own separate system. Peebles, *High Frontier*, *supra* note 90 at 33. Previously, there were US systems used to track space objects, however none were focused on the distinctive heat signature left by an ICBM or IRBM.

¹¹¹ *Ibid.* at 38. In 1991, DSP satellites alerted coalition forces to the launch of Iraqi Scud missiles – the first use of US missile warning satellites in combat. *Ibid.* at 39.

¹¹² Currently in development is the "Space Based Infrared System" (SBIRS) which will incorporate the current DSP system. The SBIRS will include much more than an early warning capability. Its operational requirements call for four mission areas: missile warning, missile defense, technical intelligence, and battlespace characterization. "Space Based Infrared System," online: Federation of American Scientists Homepage <<http://www.fas.org/spp/military/program/warning/sbir.htm>> (date accessed: 25 June 1999). The program originally entailed development of 4 satellites in GEO and 2 more in highly elliptical orbits (SBIRS-High), and a constellation of 24 additional satellites in LEO (SBIRS-Low). The US Air Force recently cancelled a demonstrator project for the SBIRS-Low program citing costs and delays in the SBIRS-High program, which is now scheduled for launch in 2004. Launch of the SBIRS-Low system is set for 2006. R. Wall, "USAF Cancels SBIRS-Low Satellite Demonstrations" *AW&ST* 150:6 (8 February 1999) 66; R. Wall, "Pentagon Delays SBIRS Launch" *AW&ST* 150:3 (18 January 1999) 26.

¹¹³ Though the early emphasis for military satellites was on scientific exploration and reconnaissance, interest in a space-based telecommunications network for the military began at least as early as Arthur C. Clarke's 1945 proposal to position three satellites in equidistant geosynchronous orbit (22,500 km) for near-global communications coverage. See *supra* note 30. The first communications satellite, Project Score, was launched on 18 December 1958 and carried a tape recorded Christmas message from President Eisenhower. Peebles, *High Frontier*, *supra* note 90 at 44. A subsequent effort relied upon the release of 400 million copper dipoles of 0.7 inch length at an altitude of 2000 miles. The "needles" were to form a 25 mile wide ring around the earth off of which communications signals could be reflected. After a successful test, the military terminated the program in the face of vigorous scientific and environmental protests. *Ibid.* at 45. Other systems were used in the 1960s until the Interim Defense Communications Satellite Program (IDCSP), later renamed the Defense Satellite Communications System (DSCS) became operational in 1967. These were followed by second and third generation satellites (DSCS II and DSCS III) providing strategic

assets supporting all three missions are indispensable to combat operations, the US space-based navigation system has now become perhaps the best-known of all military space assets outside military circles. Developed in the 1970s, and was declared fully operational on 17 July 1995,¹¹⁵ the "Global Positioning System" (GPS) relies on 21 operational satellites (with 3 spares in orbit) in medium-earth orbits in six orbital planes,¹¹⁶ The basic concept is simple though ingenious:

[The constellation of satellites flies] in twelve-hour orbits at an altitude of 12,543 miles. Each of them carries an atomic clock for precise determination of time, while ground-based tracking permits each one to know its position with similar accuracy. A ground receiver then accepts signals from the spacecraft in view, learning their positions as well as the exact times when the signals were transmitted. The receiver has its own internal clock, which is not very accurate, but the data from space allows it to synchronize this clock with those of the satellites. The receiver then calculates the length of time each signal has been in transit, traveling at the speed of light. This translates into an accurate determination of distance to each satellite. Through triangulation, the receiver then determines its own location.¹¹⁷

The system showed its great value during the 1991 Persian Gulf war by providing for combatants answers to the age-old questions "where am I" and "where am I going," to

communications from fixed military installations. They have been updated in the 1990s by the MILSTAR system, "a totally secure, jam free system; its terminals can be carried in a suitcase and set up in two and one-half minutes." D.J. Kutyna, "Indispensable: Space Systems in the Persian Gulf War" in R.C. Hall & J. Neufeld, eds., *The U.S. Air Force in Space 1945 to the Twenty-first Century* (Proceedings, Air Force Historical Foundation Symposium, Andrews AFB, MD, 21-22 September 1995) (Washington, DC: USAF History and Museums Program, 1995) 117. For mobile (tactical) communications, the US military has used systems such as the Lincoln Experimental Satellite (LES), the Tactical Communications Satellite (TACSAT I), and the Navy's Fleet Satellite Communications System (FLTSATCOM). Peebles, *High Frontier*, *supra* note 90 at 47-50. For a discussion of the legal issues raised by military use of the International Maritime Organization's INMARSAT system, see *infra* Chapter 6, section E.1.

¹¹⁴ NASA's Tiros I satellite, launched on 1 April 1960, created a revolution in weather forecasting.

However, it could not satisfy military needs for coverage, readout locations, or timeliness. *Ibid.* at 52.

DoD developed a series of satellites in the 1960s placed in 450 mile polar orbits that became the Defense Meteorological Satellite Program (DMSP). During the Vietnam war, cloud cover imagery from DMSP satellites became the basis of target selection and mission planning. *Ibid.* at 53. The program's existence was not publicly revealed until 1973. The DMSP has undergone numerous upgrades since its inception, to include sensors detecting temperature, atmospheric moisture, soil moisture, sea state, and ice cover. The DMSP has supported all major US military operations since the Vietnam War. *Ibid.* at 55.

¹¹⁵ *Ibid.* at 59.

¹¹⁶ *Ibid.* at 57.

¹¹⁷ Heppenheimer, *supra* note 62 at 348-349.

an accuracy of less than 30 feet.¹¹⁸ It was also used to guide munitions launched from air, sea, and land-based weapons to their targets providing three-dimensional position and velocity data. This constantly-improving targeting capability will likely be a significant law of war contribution made by GPS. As discussed more fully in the next chapter, the ability to target accurately implies the legal duty to do so. The better GPS accuracy becomes, the higher the burden it will place on its users to precisely distinguish legitimate from illegitimate targets, and to minimize collateral damage. Thus, it will no doubt “change the face of future warfare.”¹¹⁹ Operating on only 16 satellites in the 1991 war,¹²⁰ the system nonetheless proved itself highly useful and will be indispensable to space missions for future conflicts well into the twenty-first century.¹²¹

B. The Space Environment and Evolution of Manned Missions

Outer space is a hostile environment. The physical conditions one finds in near-earth space depends in part on the altitude. Ninety-seven percent of earth’s atmosphere lies below an altitude of 30 km.¹²² At 80 km, the pressure exerted by the atmosphere at sea level is reduced one million-fold, and at 160 km one billion-fold.¹²³ The gradual loss of atmosphere presents obvious challenges for manned missions as it requires a supply of

¹¹⁸ W.J. Boyne, *Beyond the Wild Blue: A History of the U.S. Air Force* (New York: St. Martin’s Griffin, 1998) 274 [hereinafter Boyne]. Because the US has made use of the system available to commercial and civil users shortly after the destruction of Korean Airlines flight 007 by the Soviet Union in 1983, it opened a possible security risk from a military point of view. One nightmare scenario for security analysts is the specter of a “poor man’s cruise missile” in the hands of hostile States or terrorists – that is, an old weapon suddenly made extremely accurate by use of GPS. Shukman, *supra* note 86 at 166. As a result, the US degrades the accuracy of the primary signal, establishing the difference between a “coarse acquisition” code and the encrypted “precise” code, to protect the military advantage the system offers its military and that of its allies. With growing reliance on the system by foreign and domestic non-military users, the potential liability to the US has increased proportionately. B.D. Nordwall, “World Pressure Grows for Regional GPS Augmentations” *AW&ST* 147:22 (1 December 1997) 66. For a thorough analysis of potential US liability both under domestic and international law, see J.A. Rockwell, *Liability of the United States Arising Out of the Civilian Use of the Global Positioning System* (LL.M. Thesis, Montreal: McGill University, 1996) [unpublished].

¹¹⁹ From a classified Pentagon assessment of the performance of GPS in the Gulf War. Cited in Shukman, *supra* note 86 at 163.

¹²⁰ *Ibid.* at 163.

¹²¹ In Operation Allied Force, the NATO allies made heavy use of GPS for navigation and precision-guided targeting. C. Covault, “Recon, GPS Operations Critical to NATO Strikes” *AW&ST* 150:17 (26 April 1999) 35. However, heavy military reliance on GPS is a “double edged sword” because the system is still “extremely vulnerable” to jamming. Interference by electronic jamming, or even destruction of part of the system by anti-satellite weaponry, might cripple a military force having abandoned its skills in other forms of navigation. Shukman, *supra* note 86 at 164-165.

¹²² For data in this section, see generally Dyrch and Wilkening, *supra* note 54 at 12.

oxygen sufficient to cover the entire period spent outside earth's atmosphere. It presents certain advantages however as well. For example, while aerodynamic drag slows spacecraft near the Earth's surface, it becomes increasingly less significant as the vehicle moves away from earth. "Prompt effects disappear for most practical purposes where the mesosphere and thermosphere merge at an altitude that approximates 60 miles."¹²⁴

In addition, space contains heavy belts of radiation reaching roughly 64,000 km out from earth's surface. Named for their discoverer, these "Van Allen" belts originate and terminate at each of the earth's poles curving from north to south. As a result, personnel and electronic equipment passing through, must be shielded against the radiation's effects. Even with shielding however, the radiation poses a significant danger to human health such that "it is a rare long-during spaceflight that carries its crew higher than 500 km."¹²⁵

Heat from the sun, unshielded by the atmosphere, and cold from its shadow, present additional challenges to space weaponry and personnel. As a result, space objects must be designed to contend with both thermal extremes. Further, because the force of gravity is still about 95% of its full force at an altitude of 100 miles,¹²⁶ propulsion systems headed for earth's orbit or beyond must overcome tremendous gravitational forces well past the point at which atmospheric drag affects propulsion. The stress on astronauts that such propulsion creates is extraordinary.¹²⁷

¹²³ *Ibid.* at 13.

¹²⁴ Collins, *supra* note 25 at 10.

¹²⁵ *Ibid.* Solar flares, which erupt abruptly from the surface of the sun, pose an even greater hazard that remains dangerous for any orbital altitude.

¹²⁶ Collins, *supra* note 25 at 10.

¹²⁷ *Ibid.* at 11. Scientists use the term "g" as a measurement of acceleration because this compares the forces creating acceleration to the pull of Earth's gravity. Standing on the earth at sea level produces an acceleration force of 1 g. This amounts to being accelerated with a velocity change of roughly 32.17 feet per second every second. "Automobiles rarely achieve accelerations of 1 g, but airplanes can produce accelerations of 10 g's or more while turning. Rocket vehicles can generate accelerations as high as 100 g's." Stine, *infra* note 131 at 60. Because of this, and because accelerations of 18 to 23 g's begin to cause structural physical damage, especially to the spinal column, the design of space launchers for human missions require "proper cushioning and support to distribute the forces over as much of the body as possible." *Ibid.* at 70. Stine points out the difference between "eyeballs in" acceleration that pushes pilots and astronauts back into their seats, and the opposite "eyeballs out" acceleration encounter in most crash and reentry scenarios. *Ibid.* at 61. Because their seats support their bodies, "eyeballs in" acceleration is easier to withstand.

Although animal life had been temporarily sustained in space with the launch of Sputnik II in late 1957,¹²⁸ it was not until 12 April 1961 that human life was tested. Given the military implications for space, it is not surprising that the first human in space was a military officer.¹²⁹ The first US astronauts in space were all military officers as well.¹³⁰

In most respects, manned missions are much more complex than unmanned missions. Living conditions taken for granted on earth – air pressure and composition, temperature control, acceleration, gravity, nutrition, sanitation, recreation, health, medicine – must be supplied for each mission.¹³¹ As a result, military applications have focused on the achievement of mission capability with *un*manned spacecraft wherever possible. However, there have also been attempts to develop a manned military mission in space.

For reasons similar to those motivating civil manned spaceflight, manned military missions have played a role in the militarization of space. In addition to the successful Mercury, Gemini, and Apollo programs, two manned space programs of a strictly military character, and both eventually cancelled, characterize early military manned space missions. The first, termed Dyna-Soar (for “dynamic soaring”), sought to create a transport system capable of a rocket-assisted launch to orbit and aerodynamic descent for a horizontal landing following reentry. The second sought to establish a permanent military manned presence in space and went by the name Manned Orbiting Laboratory (MOL).

¹²⁸ Emphasis here goes on the word “temporarily.” On 3 November 1957, the Soviets launched a dog, “Laika,” aboard the 1,120 pound Sputnik II. Following launch, the satellite did not separate from its booster, lost its thermal control system, and overheated. The dog was dead within a day and burned up upon reentry with the satellite about one week later. Heppenheimer, *supra* note 62 at 126.

¹²⁹ Yuri Gagarin, born in 1934 was a pilot in the Soviet air force before becoming a cosmonaut. See *ibid.* at 191.

¹³⁰ The first, Alan B. Shepard, was a member of the US Navy. The second, Virgil (“Gus”) Grissom, was a member of the US Air Force. Indeed all of the famed “Mercury 7” were from the military services, as follows: Scott Carpenter – Navy; Walter Schirra – Navy; John Glenn – Marine Corps; Gordon Cooper – Air Force; Donald (“Deke”) Slayton – Air Force. D.K. Slayton, *Deke! U.S. Manned Space: From Mercury to The Shuttle* (New York: Forge/Tom Doherty Associates, 1994) at 73.

¹³¹ In his fascinating study of conditions necessary for human life in space, Stine predicts that the human race will continue tending toward what Robert Heinlein called “the Great Diaspora.” G.H. Stine, *Living in Space: A Handbook for Work & Exploration Beyond the Earth’s Atmosphere* (New York: M. Evans & Company, 1997) at 1 [hereinafter Stine]. He asserts that “[p]lanet earth has been the cradle of the human race, but people always leave the cradle to do things in the great universe beyond the nursery.” *Ibid.* at 3.

The Dyna-Soar program proved to be an idea before its time. Having been proposed in 1957 as a consolidation of three previous military manned spaceflight programs, the Dyna-Soar proposal envisioned a space transportation system in which the space vehicle was to be launched vertically on a conventional booster. Following an orbital or suborbital flight path, the vehicle would make an aerodynamic, horizontal landing. Progressive suborbital testing to begin in 1963 was to lead to an orbital flight for purposes of reconnaissance and bombing missions.¹³² When funded in 1959, the program's primary goal was to test suborbital flight; only secondarily would it test "military systems and orbital flight."¹³³ The program schedule called for the first manned orbital flight in early 1967.¹³⁴ After numerous studies during program development however, the DoD could not clearly identify a manned military space mission distinct from the manned missions already occurring under NASA.¹³⁵ This, coupled with several technical challenges,¹³⁶ lead to cancellation of the Dyna-Soar program on 9 December 1963.¹³⁷ The program was not a complete loss however, as it became the basis for the US Space Shuttle program.¹³⁸ While the subsequent Space Shuttle program would be managed by NASA, military requirements factored heavily in its design.¹³⁹

As part of the justification for cancellation of Dyna-Soar the DoD announced that the program would be replaced by the Manned Orbiting Laboratory program.¹⁴⁰ MOL's objective was to test the military usefulness and feasibility of extended manned space

¹³² Peebles, *High Frontier*, *supra* note 90 at 16.

¹³³ *Ibid.* at 18.

¹³⁴ *Ibid.* at 19.

¹³⁵ *Ibid.* at 20. Nonetheless, the Secretary of Defense at the time, John McNamara, stated that a *space station* would be important to military space activity and that multi-manned, long duration orbital flights were "most important to military space activities." *Ibid.*

¹³⁶ These included: 1) the fact that a winged, manned, recoverable spacecraft did not possess as large a payload as a manned capsule-type spacecraft; 2) increased time required to develop; and 3) increased cost. *Ibid.* at 19.

¹³⁷ *Ibid.* at 21. Just about every commentator on the Dyna-Soar program notes the irony of its title in light of its ultimate demise. Before its cancellation, the program had been given a numerical title, X-20, to reflect its research role. However the program never fully shed its more memorable title.

¹³⁸ For a review of the military programs involving manned spaceflight before and after Dyna-Soar see L. Kelly, *The Spaceplane: The Catalyst for Resolution of the Boundary and 'Space Object' Issues in the Law of Outer Space?* (LL.M. Thesis, Montreal: McGill University, 1998) [unpublished].

¹³⁹ *Ibid.* at 26. Initially, NASA considered a payload capacity of 25,000 pounds with a bay measuring 14 feet wide by 45 feet long. The Air Force insisted that the capacity must be 65,000 pounds and the bay 15 by 60 feet. Despite increasing the size, weight, and therefore cost of the shuttle, the Air Force changes were adopted. Heppenheimer, *supra* note 62 at 255.

¹⁴⁰ Peebles, *High Frontier*, *supra* note 90 at 22.

missions. As such, it was not intended to create a military "space station" for research, combat or other purposes. The purpose of the program was not to develop an operational manned military space system either.¹⁴¹ Its modest goal was simply to determine whether man could have a role in space and how the unique capabilities of a manned presence could benefit various military space activities.¹⁴² The MOL was to be attached to a two-man Gemini B spacecraft for 30-day flights during which astronauts would conduct experiments in the laboratory. At the end of each mission, the crew would return to the Gemini B for atmospheric reentry.¹⁴³ Once again however, the mission was not thought sufficient to justify the escalating cost.¹⁴⁴ The program, begun in late 1963, was cancelled in June 1969 having never made a manned launch. One military critic of the decision declared that "cancellation...concedes to the Russians control of space."¹⁴⁵

Though the manned missions of the 1960s through the present US Space Shuttle, which included nine uniquely military missions,¹⁴⁶ have yielded important insights into human survival in space, manned missions will not likely play a large role in space combat for some time. This conclusion flows not only from limitations created by the hostile space environment, but also from the apparent vulnerability of *any* space object, especially a pressurized construction designed to sustain life. Even assuming technological advances proceed to create effective defenses for manned space vessels, as for example a tactical laser system, the destruction of an oncoming missile or other projectile still leaves the vessel vulnerable to the inert mass hurtling on toward it. These challenges, as well as the increased cost of manned missions, will stand as continuing obstacles to the fielding of an efficient military manned space capability. Beyond this, although a human being is the "ultimate system component – lightweight, reprogrammable,

¹⁴¹ For example, the MOL's orbit was planned so it would not pass over the Soviet Union and its military mission planners did not envision the use of any "reconnaissance quality" photography. *Ibid.*

¹⁴² *Ibid.*

¹⁴³ *Ibid.*

¹⁴⁴ Not only were NASA's manned space station and space shuttle programs competing for funding, but President Johnson's popular "Great Society" social programs left little money for space efforts other than the Apollo Moon program. *Ibid.* at 25.

¹⁴⁵ Lieutenant General Ira C. Eaker, USAF (Ret.), quoted in Spires, *supra* note 56 at 133.

¹⁴⁶ The Shuttle flight of 24 January 1985, designated mission STS-51C, marked the first military mission and carried a classified payload into orbit. Peebles, *High Frontier*, *supra* note 90 at 29. The final military Shuttle flight occurred on 2 December 1992 marking the end of military manned space flight for the foreseeable future. *Ibid.* at 31.

and already designed and tested,”¹⁴⁷ scientific innovation continues to create acceptable alternatives.

C. Present and Potential Technologies Available for Space Combat

To date, there has not been a single reported case of force used in outer space by one nation against another.¹⁴⁸ Nonetheless, given the increasing global reliance on space systems, and increasing militarization of space, its weaponization and evolution into a distinct theater of military operations seems likely. Though technologies applicable for space combat will include a wide variety of military instrumentalities, the development of space weapons is the most obvious choice. Such weapons can be grouped according to a variety of criteria.¹⁴⁹ They can be grouped by missions intended such as anti-satellite and missile defense, or by method of pursuit such as boost phase intercept and direct ascent.¹⁵⁰ Depending on its characteristics, a space weapon could fit within several different categories at once. One of the most logical means of identification focuses on the weapon's means of destruction as its distinguishing feature. Most probable future space weaponry can be described using this method of identification, including those representative samples discussed in the six categories below.

¹⁴⁷ A.L. Gruen, "Manned versus Unmanned Space Systems" in R.C. Hall & J. Neufeld, eds., *The U.S. Air Force in Space 1945 to the Twenty-first Century* (Proceedings, Air Force Historical Foundation Symposium, Andrews AFB, MD, 21-22 September 1995) (Washington, DC: USAF History and Museums Program, 1998) 67 at 68. Gruen continues: "If today there is an Air Force colonel somewhere deep in the bowels of the Pentagon with the job of defining military missions for physical human presence on board a spacecraft, then I do not envy him the assignment. We are fast reaching the point where on Earth we barely even need humans flying weapon systems in the combat zone at all. ... Perhaps there will be a role for humans in space in the twenty-first century. It may not be a very glamorous role, but there might be some logic to it." *Ibid.* at 74-75.

¹⁴⁸ Vlasic, "Space Law and Military Applications," *supra* note 52 at 397-398.

¹⁴⁹ For a discussion of the problem of defining "space weapon" see notes 646 through 651 and accompanying text.

¹⁵⁰ An example of the latter is the US ASAT Air-Launched Miniature Vehicle (ALMV). First tested against a functioning satellite on 13 September 1985, the ASAT "kill vehicle" was launched aboard a missile from an F-15 for ascent to the target satellite and destruction by impact. "The warhead, or Miniature Vehicle (MV), is an extremely complex and sophisticated device consisting of eight cryogenically cooled infrared telescopes, a laser gyro, and sixty-four small computer-controlled rockets used for final course adjustments before colliding with the target. All this is packed into a twelve-by-thirteen-inch casing. After being guided to and released near the target, the Miniature Vehicle homes in on the heat emitted by the satellite and rams into it with sufficient force to destroy it." P.B. Stares, *Space and National Security* (Washington, DC: The Brookings Institution, 1987) at 99 [hereinafter Stares, *Space and National Security*]. See also C. Covault, "Antisatellite Weapon Design Advances" *AW&ST* 112 (16 June 1980) 243. In terms of destructive classification, the ALMV is a kinetic energy weapon.

1. Electromagnetic and Radiation Weapons

Perhaps the quintessential electromagnetic and radiation weapon is the nuclear bomb. Recognizing this, the first ASAT system made operational by the US involved a nuclear detonation in space.¹⁵¹ Though the history and basic functioning of nuclear weapons have been noted previously, it is appropriate to briefly consider their effect as a weapon when detonated in outer space. Given the near-vacuum conditions of space, the range of a nuclear blast in terms of spreading radiation and heat is greatly diminished. In the absence of atmosphere, radioactive fallout cannot occur.¹⁵² Further, the shock waves, violent winds, and intense heat generated by a nuclear blast within the atmosphere, do not occur in space.¹⁵³ As a result, the collateral damage from the effects of heat and blast is fairly easy to confine.¹⁵⁴ Though the local effects in space from such a detonation can be very destructive, the most significant military effect of nuclear blasts in space relates to the creation of an electromagnetic pulse (EMP) in near-earth space where the outer space vacuum contacts the atmosphere.¹⁵⁵

An EMP is created when "a cascade of gamma rays from any nuclear explosion in space collides with the upper atmosphere."¹⁵⁶ As these gamma rays race nearly instantaneously downward toward the top of Earth's atmosphere, resultant charge imbalances create an electrical current that peaks 100 times faster than lightening, and is largely unrelated to the size of the detonation for any yield over a few hundred kilotons.¹⁵⁷ Similar to a lightning strike, the EMP lasts only for a millionth of a second but holds potential for devastation of sensitive circuitry. Unshielded electronics within several hundred miles of the epicenter may be disabled as every unshielded conductor in

¹⁵¹ Though the previous SAINT ("satellite interceptor") system had been developed, it was never fielded. The latter system, known simply as Program 437, utilized a nuclear warhead launched atop a Thor IRBM from Johnson Island in the South Pacific. With a yield of one megaton, the warhead had a kill radius of five miles. The system was declared fully operational on 10 June 1964, and remained in service or available for speedy redeployment until it was terminated on 1 April 1975. See Peebles, *High Frontier*, *supra* note 90 at 62-65.

¹⁵² Collins, *supra* note 25 at 28.

¹⁵³ In a vacuum, winds do not blow and shock waves cannot develop where no medium such as air, water, or earth resists compression. As for heat, the fireballs normally associated with nuclear blasts in the air do not occur above 65 miles (approximately 100 km). *Ibid.* at 29.

¹⁵⁴ By contrast, collateral damage from initial nuclear radiation "regardless of type, is indiscriminate, ... [and] would be difficult to predict and expensive to control." *Ibid.* at 31.

¹⁵⁵ Such an event was dramatically portrayed in the recent Hollywood production "Goldeneye."

¹⁵⁶ Collins, *supra* note 25 at 29.

its path acts as a conductor. The higher the burst, the larger the area affected in the air and land beneath. A burst at a height of 300 miles (483 km) would affect the entire continental US.¹⁵⁸ "Poorly protected satellites and solar power systems in orbit are particularly vulnerable, because risk radii extend hundreds (sometimes thousands) of miles farther in space than in absorbent air."¹⁵⁹

In addition to the effects of an EMP, "beta particles and gamma rays respectively cause intensive and extensive alterations in the ionosphere."¹⁶⁰ These weaken both radio and radar waves. This can result in high frequency blackouts over broad areas, followed by periods of impaired radio and radar performance.¹⁶¹ Thus, the disruptive capabilities of a nuclear blast in space hold distinct military advantages.¹⁶² Nonetheless, in addition to the legal hurdles discussed subsequently in Chapter Four, Peebles notes that when first considered for its strategic value, the stationing of a nuclear weapon in space "made no technical or military sense" for at least four reasons, at least some of which are applicable today:

First, an orbiting weapon required elaborate spacecraft systems, such as retro-rockets to deorbit it, others to guide it, and still others to arm it. Second, all of these integrated systems would have to perform reliably while on orbit for many months if not years, or the bomb became useless. ... Third, if used in retaliation, such weapons could not be delivered at a moments notice, but would have to wait at least an orbit or two until the Earth turned beneath it and the intended target [came] into view. Finally, and perhaps most tellingly, if such a weapon were used for a first strike and a partial malfunction occurred as the nuclear bomb moved along its orbit, it might just as easily fall on Buenos Aires as on Washington D.C., or, worse yet, on Moscow.¹⁶³

¹⁵⁷ *Ibid.* at 31.

¹⁵⁸ *Ibid.* at 30.

¹⁵⁹ *Ibid.*

¹⁶⁰ *Ibid.* The ionosphere exists from 30 to 500 miles (approximately 48 to 805 km) above the earth's surface. *Ibid.* at 9.

¹⁶¹ During a detonation at 48 miles (77 km) altitude on 1 August 1958 over Johnson Island, the US observed the degradation of HF radio traffic throughout a region several thousand miles in diameter for a period of approximately six hours. *Ibid.* at 29.

¹⁶² Indeed the Soviet Union used an array of 64 nuclear tipped anti-ballistic missiles around Moscow as a small-area missile defense system. Code named "Galosh," the system undoubtedly could be converted into an ASAT system. Stares, *Space and National Security*, *supra* note 150 at 96.

¹⁶³ Peebles, *High Frontier*, *supra* note 90 at 59.

For these and other reasons, and despite the unquestioned devastating effects for any nation relying on sophisticated electronic infrastructure, a nuclear-triggered EMP attack on the US is deemed unlikely. The Chairman of President Clinton's recent Commission on Critical Infrastructure labeled it "the most remote part of the threat spectrum."¹⁶⁴

Non-nuclear electromagnetic weapons have also been proposed. A study for the US Air Force analyzing the future of air and space power recently reported that "[t]he technology of high RF [radio frequency] power and large antennas is about to greatly expand." The report concludes that when combined, these innovations will allow for the projection of extremely high power densities, including electromagnetic radiation, over extremely long distances to land, air, and space-based targets.¹⁶⁵ As an example, the report suggests that such a weapon in the geosynchronous orbit could create a 6 mile footprint on a battlefield which would "blank out" all radar receivers and would damage all unprotected communication sets within that area. The tremendous power envisioned would also allow injection of signals into even heavily shielded communications networks, allowing for "information warfare to be waged at will."¹⁶⁶

2. Kinetic Energy and Hypervelocity Weapons

Kinetic energy weapons, of which hypervelocity weapons are a subtype, are historically the most common form of space weaponry. As suggested above, given the tremendous speeds at which objects travel in orbit, on the order of 4.7 miles per second in low earth orbit, just about anything properly aimed could become a weapon even without the use of an explosive warhead. This is true because such an object's speed, including those of very small masses, gives it tremendous kinetic energy for impact.¹⁶⁷ One US kinetic energy weapon, originally tested as a missile interceptor, could equally serve as an

¹⁶⁴ Quoted in J.C. Anselmo, "U.S. Seen More Vulnerable to Electromagnetic Attack" *AW&ST* 147:4 (28 July 1997) 67.

¹⁶⁵ I. Bekey, "Force Projection from Space" in United States Air Force Scientific Advisory Board, *New World Vistas: Air and Space Power for the 21st Century*, Space Applications Volume (Washington DC: Department of the Air Force, December 1995) 83 at 84 [hereinafter Bekey].

¹⁶⁶ *Ibid.* at 85. With respect to information warfare, the report gives the following examples: network viruses, disinformation, memory erasures, and false signals. For a brief discussion of information warfare and its relation to space combat, see *infra* Chapter Six, section D.

¹⁶⁷ For example, a 4,000 pound automobile would have to travel almost 270 miles per hour to equal the kinetic energy of a one-pound projectile traveling at 4.7 miles per second. D.E. Lupton, *On Space Warfare: A Space Power Doctrine* (Maxwell AFB, AL: Air University Press, 1988) at 22.

ASAT. Known as the Homing Overlay Experiment (HOE), the weapon, once boosted into space, unfurls a 4.5 meter radial “net” that is wrapped tightly behind the nose sensor. The net increases the lethal radius of the homing and kill vehicle. Successful testing in 1983 and 1984 showed the weapon capable of homing in and destroying a dummy warhead in space using a long-wavelength infra-red sensor.¹⁶⁸

A program currently under development in the US is simply called the “KE ASAT” (kinetic energy ASAT). The system envisions using a large Mylar “shroud” to impact the target object.¹⁶⁹ Though it will disable its target object by force of impact as will many other kinetic energy ASATs, this system is unique in that the shroud is intended to minimize the creation of a large quantity of resulting space debris normally associated with kinetic energy weapon impacts.¹⁷⁰

The railgun is another type of kinetic energy weapon that accelerates a projectile toward selected targets at hypervelocity speeds. Because the railgun will use electromagnetic forces to accelerate its projectiles, it is an “electromagnetic” weapon of sorts. However, it is distinct from the electromagnetic weaponry discussed above in that the final method of destruction is a kinetic impact rather than an electromagnetic force itself. Testing in the US has resulted in the electromagnetic acceleration of tantalum discs to speeds of 11 kilometers per second.¹⁷¹ Though not yet developed as a weapon, such railguns could be stationed in outer space.

A space-based kinetic energy weapon that has been proposed but not yet developed is not an ASAT, but has been conceived for use against terrestrial targets. It would capitalize on the tremendous speed of long rods made of depleted uranium orbiting in space. Remotely commanded to reenter the atmosphere at hypersonic speeds, the rods could be precision-guided to targets in the air or on the surface of the Earth. Their special shape and materials would allow for survival on reentry into the atmosphere with little prospect for collateral damage on impact. The ability to call down such objects from

¹⁶⁸ B. Jasani, “Space Weapons and International Security – An Overview” in B. Jasani, ed., *Space Weapons and International Security* (Oxford, UK: Oxford University Press, 1987) 22 [hereinafter Jasani, “Space Weapons”].

¹⁶⁹ “Kinetic Energy Anti-Satellite,” online: Federation of American Scientists Homepage <http://www.fas.org/spp/military/program/asat/ke_asat.htm> (date accessed: 25 June 1999).

¹⁷⁰ *Ibid.*

¹⁷¹ *Ibid.* at 20.

space at hypervelocity speeds would allow them to penetrate hundreds of feet into the Earth. Strategically, it would also offer the attacker the “ultimate stealth” and maximum surprise.¹⁷²

A final example in the kinetic energy category is the Gun Launch to Space (GLTS) project. The project envisions a large artillery-type structure capable of launching projectiles hundreds of miles. The most notable example of rudimentary technology on which the GLTS might be based was the Iraqi “supergun,” employing a barrel 172 feet long and capable of propelling 114 pound projectiles to distances of 465 miles.¹⁷³ Although principally conceived as a system for boosting operational payloads to orbit, the GLTS project has numerous potential applications, including service as an ASAT.¹⁷⁴

3. Laser Weapons

“Laser” is an acronym for Light Amplification by Stimulated Emission of Radiation and is a device that produces a narrow beam of radiation by means of a physical emission. The light constituting the laser beam can be produced by a variety of chemical means. Key components of such a weapon include both the laser itself and the beam control subsystems which aim the beam. Once created, the beam used in the proposed weapon’s laser is so concentrated that it can be projected for extremely long distances with very little loss of energy. Study on laser weapons, including those capable of disabling satellites, began in the early 1960s, and received increased attention as part of the Strategic Defense Initiative.¹⁷⁵ Despite tremendous technical problems, mostly still unresolved, lasers could radically change warfare if ever fielded.¹⁷⁶

¹⁷² Bekey, *supra* note 165 at 83.

¹⁷³ M. Potter, “Gun Launch to Space: International Policy and Legal Considerations” in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1992) 305.

¹⁷⁴ *Ibid.* at 306.

¹⁷⁵ Stares, *The Militarization of Space*, *supra* note 87 at 111.

¹⁷⁶ During the height of research on the Strategic Defense Initiative many scientists openly questioned that a missile defense project involving space-based lasers could ever work. The Union of Concerned Scientists declared that an effective defense of the US against a Soviet missile defense was “unattainable.” A report from the Congressional Office of Technology Assessment claimed the likelihood that such a system could protect the US from Soviet missile attack “so remote that it should not serve as the basis for public expectations or national policy.” Quoted in L.B. Taylor, Jr., *Space: Battleground of the Future?*, rev’d ed. (New York: Franklin Watts, 1988) at 24 [hereinafter Taylor]. Partly because of the tremendous technical difficulties, the program began to refocus on earth-based lasers.

At present, the US is developing space, air, and ground-based lasers for possible use as weapons against enemy missiles and satellites. One of the two principal US ground-based lasers is the Mid-Infrared Advanced Chemical Laser (MIRACL).¹⁷⁷ As the name suggests, the laser beam is generated by chemical reactions, produced by deuterium fluoride, resulting in a focused beam that is 14 cm square.¹⁷⁸ It is the largest laser in the developed in the US, undergoing numerous tests since 1985 when it destroyed a stationary ICBM on the ground. In the late 1980s, the US Congress prohibited DoD from using the laser against space objects. The prohibition expired in 1995, however, and Congress failed to renew the ban. On 17 October 1997, the MIRACL "illuminated" a satellite in orbit constituting the first-ever US use of a laser against a satellite.¹⁷⁹ Though it did not destroy the object, the move was widely seen as a potential first step toward development of a laser ASAT capability.¹⁸⁰ No further tests against space objects are scheduled.

The airborne laser (ABL) program under development calls for a much smaller laser system housed within a modified 747 aircraft. The weapon was conceived as a defense against missile threats but if the program continues to prove as successful as its latest tests (tracking ballistic missiles, overcoming atmospheric distortion), US Air Force officials are weighing expanding its role to reconnaissance, cruise missile defense, and

¹⁷⁷ The other ground-based program is a free-electron laser designed to reflect its high-energy beam off orbiting space mirrors for redirection back to ground targets.

¹⁷⁸ "Mid-Infrared Advanced Chemical Laser," online: Federation of American Scientists Homepage <<http://www.fas.org/spp/military/program/asat/miracl.htm>> (date accessed: 25 June 1999). The beam is created via chemical reaction as follows: "Just downstream from the combustor, deuterium and helium are injected into the exhaust. Deuterium combines with the excited fluorine to give excited deuterium fluoride molecules, while the helium stabilizes the reaction and controls the temperature. The laser's resonator mirrors are wrapped around the excited exhaust gas and optical energy is extracted. The cavity is actively cooled and can be run until the fuel supply is exhausted. The laser's output power can be varied over a wide range by altering the fuel flow rates and mixture." *Ibid*.

¹⁷⁹ M.A. Dornheim, "Laser Engages Satellite, With Questionable Results" *AW&ST* 147:17 (27 October 1997) 27. The test was not intended to destroy the satellite but merely examine what various MIRACL power levels could do to the target satellite's sensors. An official reported that the anticipated data gathering from the satellite was unsuccessful.

¹⁸⁰ Following the test, the Russian Foreign Ministry issued a statement saying that the laser "may become a step toward creating an anti satellite potential." Even before the test, several US lawmakers sent President Clinton a letter stating "[w]e are deeply troubled that a test of a ground based laser system with such obvious ASAT warfare capabilities would proceed ahead of any debate or deliberate policy development." S. Fournier, "U.S. Test-Fires 'MIRACL' at Satellite Reigniting ASAT Weapons Debate," online: Arms Control Association Homepage <<http://www.armscontrol.org/ACT/oct97/miraclact.htm>> (date accessed: 25 June 1999).

suppression of enemy air defenses.¹⁸¹ The laser, still under development, will use an oxygen-iodine combustion process to produce the intense light. The first airborne test firing of the laser against a missile is scheduled for 2002.¹⁸² Although the ABL has not been envisioned for an ASAT role, its anticipated 250 mile range would make it capable of reaching missiles and satellites in low orbits.

Space-based laser systems (SBLs) that target other space objects have the dual advantage of being less vulnerable to attack and avoiding the distorting effects of Earth's atmosphere. The laser currently envisioned for the SBL system uses a hydrogen fluoride chemical reaction to create its light beam. Unlike the MIRACL and ABL systems, it must be developed to operate in the low pressure environment of space. The prototype Alpha laser was successfully tested in 1991 under conditions simulating the space environment. Results from the test showed that megawatt power levels similar to the MIRACL but optimized for space can be built and operated.¹⁸³ However, as with all three laser weapons programs several technical challenge remain for SBLs, including keeping the satellites loaded with a sufficient quantity of chemicals necessary to fuel the laser.¹⁸⁴ Current estimates call for space-based laser testing to begin sometime between 2005 and 2008.¹⁸⁵

4. Particle Beam Weapons

The first proposed use of particle beam weapons for satellite defense occurred in 1965.¹⁸⁶ Even more technically challenging than lasers, both particle beam and laser weapons constitute "directed energy" weapons – that is, weapons which destroy their targets by delivering energy at or near the speed of light (approximately mach one million). This would be a considerable advantage during time-urgent military

¹⁸¹ D.A. Fulghum, "Airborne Laser Aimed At New Defense Roles" *AW&ST* 149:14 (5 October 1998) 111; D.A. Fulghum, "Airborne Laser Tested, Weighed for New Missions" *AW&ST* 147:17 (27 October 1997) 26. The ABL program manager, Colonel Michael Booen, stated that "[t]his [laser's success] is going to break the door down for directed energy weapons." *Ibid.*

¹⁸² W. Matthews, "Laser Faces 'Challenges,' Report Says" (19 January 1998) *The Air Force Times* 24.

¹⁸³ "Space Based Laser," online: Federation of American Scientists Homepage <<http://www.fas.org/spp/starwars/program/sbl.htm>> (date accessed: 25 June 1999).

¹⁸⁴ J.R. Asker, ed., "Washington Outlook" *AW&ST* 150:21 (24 May 1999) 27.

¹⁸⁵ M.A. Dornheim, "Pentagon Mulls Space Laser Test" *AW&ST* 148:12 (23 March 1998) 32.

¹⁸⁶ Stares, *The Militarization of Space*, *supra* note 87 at 111.

engagements.¹⁸⁷ In theory, a particle beam weapon could mimic the effects achieved by an electron accelerator by transferring energy to its target at nearly the speed of light. In so doing, it would transfer thermal energy similar to the action of a lightning bolt.¹⁸⁸ Unlike the short attack of a nuclear (or other) blast-triggered EMP, a particle beam weapon could keep its destructive beam focused on the target for longer periods of time.

Particle beam weapons differ from lasers in several respects. The former do not heat the surface of their targets as lasers do. Thus, the particle beam weapon does not weaken the structure of its target, but eats through the skin and damages its internal mechanisms.¹⁸⁹ Because it does not rely on light energy, the particle beam weapon would not be affected by cloud cover or a reflective coating as would a laser. However, despite their theoretical advantages, such weapons are exceedingly difficult to produce because of the high-energy current and repetition rates required.¹⁹⁰

5. Explosive Proximity Weapons

The category of space weapons characterized by an explosion in proximity to its target is perhaps the most self-evident form of space weaponry. This type of weapon simply steers close to its target and blows it up by detonation in the target's vicinity. The best example is the Soviet ASAT system, first tested in the late 1960s and fielded in the 1970s.¹⁹¹ The explosive "kill vehicle" is rocket launched to coincide with the period during which the Earth's rotation will put the weapon into the same orbital plane as the target satellite. Once the ASAT achieves orbit, ground controllers maneuver the object for 1 to 2 revolutions of the Earth until it is close enough to the target for its own guidance system to activate. "When in range an explosive charge aboard the interceptor

¹⁸⁷ Another theorized advantage of directed energy (DE) weapons will be the range of employment options offered. These could fill the gap between diplomacy and bombs by allowing for an escalating scale of destructive from minor disruption to the target to total destruction. See W.B. Scott, "'Beam' Weapons Edging Into Arsenal" *AW&ST* 151:1 (5 July 1999) 53.

¹⁸⁸ Taylor, *supra* note 176 at 33. Because of its great speed and capacity for repeat firing, Taylor suggests that particle beams "would do to the ballistic missile virtually what the machine gun did to the infantry charge." *Ibid.* at 34.

¹⁸⁹ *Ibid.* at 33.

¹⁹⁰ *Ibid.* at 35.

¹⁹¹ Some conceive this ASAT as a kinetic energy weapon. "The Soviet ASAT system could be categorized as a rocket-propelled KEW." Jasani, "Space Weapons," *supra* note 168 at 19. However, as its title suggest, a kinetic energy weapon derives its value as a weapon not from an explosive capacity, if any, but its kinetic

is detonated, sending a cloud of shrapnel at high speed to destroy the target.”¹⁹² Repeated testing has shown the system to be marginally effective.¹⁹³ Recent reports of Russian work on an EMP ASAT may prove more effective.¹⁹⁴

Though not yet developed, “space mines” are another type of proximity weapon that tracks down its target and detonates on impact or other trigger event. Commentators suggest that the detonators for such mines could be activated by command from Earth which could be triggered by, for example, reaction to heat or mechanical action.¹⁹⁵ Although similar to kinetic energy weapons, the space mine’s method of destruction is not the force of impact but the detonation.

6. ‘Soft Kill’ Weapons

A final category includes those weapons designed to disable their space-based targets, usually satellites, rather than destroy them. Though never fielded, at least three types of systems in this category have been considered, all of which rely on rendezvous with the target satellite.¹⁹⁶ First, weapons that spray paint onto the optics, solar arrays, or radiators of the target would disrupt power supplies or mission execution. Second, a target satellite could be nudged or tipped out of its current orbit in order to exhaust its control fuel. Third, electronic jamming could disrupt a satellite’s proper functioning or shut it down altogether. In each case, unless detected before the “attack,” disabling missions such as these could be undertaken covertly and the true source never be detected or proven. Because the results of these “soft kills” often mimic routine failures, detection would prove difficult.¹⁹⁷

energy. The design of the Soviet System relies heavily on its explosive charge; the ASAT need not even physically impact its target vehicle.

¹⁹² Stares, *Space and National Security*, *supra* note 150 at 87. The average wait before launch can occur in order to attack a specific satellite is six hours. *Ibid.* at 88.

¹⁹³ *Ibid.* at 86.

¹⁹⁴ Reportedly, the Russians resumed ASAT testing in April with a design that will utilize an EMP. As reported, the Pentagon considers this a “serious development” given that satellites are the “Achilles’ heel” of the U.S. military’s high-technology force used for sending orders to forces around the world as well as communicating with troops and organizing logistics.” B. Gertz & R. Scarborough, “Russian ASAT” (18 June 1999) *The Washington Times* 9.

¹⁹⁵ A.A. Kokoshin, A.A. Vassiliev & M.I. Gerasyov, “Measures for Counteracting Space Strike Weapons” in B. Jasani, ed., *Space Weapons and International Security* (Oxford, UK: Oxford University Press, 1987) 92.

¹⁹⁶ See Bekey, *supra* note 165 at 87.

¹⁹⁷ *Ibid.*

Chapter Three: The Law of War¹⁹⁸

[The law of armed conflict] is no longer a body of law designed to ensure a fair fight between two opponents; . . . Today, the law of armed conflict is designed primarily to minimize suffering and prevent unnecessary destruction. This being so, belligerents are held to the standards to which they are capable of rising.¹⁹⁹

Lieutenant Colonel Michael N. Schmitt,
USAF (1998)

Scholars have advanced numerous reasons for maintaining an international law of armed conflict.²⁰⁰ At first glance, the creation of rules for war – apparently the ultimate

¹⁹⁸ This thesis uses the phrases “law of war,” “law of armed conflict,” and “humanitarian law” as being essentially synonymous. Historically, the term “law of war” has been used, although “law of armed conflict” is more accurate given that such law applies in cases of conflict not amounting to “war.” “Law of war” will generally be used herein in order to highlight the connection between the relevant treaty regimes, rooted in the first five decades of the twentieth century, and current State practice. Some scholars articulate distinctions between the three terms noting for example that “humanitarian law” is that subset of the law of war that concerns itself specifically with the reduction of human suffering. However, because the reduction of suffering is ultimately the goal of *all* restrictions on the means and methods of warfare, such distinctions seem overly technical. Others, such as the International Court of Justice prefers the term “international humanitarian law” which it describes as the synthesis of “Hague Law,” governing means and methods of warfare, and “Geneva Law,” governing the protection of the victims of war. *The Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion, [1996] I.C.J. Rep. 1 at 27, Reprinted at 35 I.L.M. 809 [hereinafter *Advisory Opinion on Nuclear Weapons*]. This definitional framework is ultimately helpful as it attempts to contain the full range of law governing the use of force in combat to a single category of international law. However, use of terms like “humanitarian” when applied to limits on war’s means and methods risks merely equating the law of war with human rights law. On the dangers associated with doing so, see *infra* notes 254 and 309. As used here the “law of war” includes what in peacetime one might label “human rights” law, beyond principles normally included in the body of humanitarian law. On the connection between human rights law and the law of war, see H. Levie, “Violations of Human Rights in Time of War As War Crimes” in M.N. Schmitt & L.C. Green, eds., *Levie on the Law of war*, International Law Studies, vol. 70 (Newport, RI: U.S. Naval War College, 1998) 373; R. Provost, “Reciprocity in Human Rights and Humanitarian Law” (1994) 65 B.Y.I.L. (Oxford, UK: Clarendon Press, 1995) 383. The Institute of International Law recognized that, at a minimum, the law of armed conflict comprises more than simply humanitarian rules. See, e.g., I.I.L., *Conditions of Application of Rules, Other than Humanitarian Rules, of Armed Conflict to Hostilities in Which United Nations Forces May be Engaged*, 13 August 1975 in D. Schindler & J. Toman, eds., *The Laws of Armed Conflicts: A Collection of Conventions, Resolutions and Other Documents* (Dordrecht: Martinus Nijhoff, 1988) 907 [hereinafter Schindler & Toman].

¹⁹⁹ Schmitt, “Bellum Americanum,” *supra* note 6 at 412.

²⁰⁰ Reasons commonly heard include the following six, recounted by B.V.A. Röling, “The Significance of the Laws of War” in A. Cassese, ed., *Current Problems in International Law: Essays on U.N. Law and on the Law of Armed Conflict* (Milan: Dott. A. Giuffrè Editore, 1975) 133: diminishing suffering, diminishing the moral depravation of the soldiers, lessening the dangers that threaten the survival of our civilization, lessening the dangers that threaten the survival of mankind, favorably impacting the peacetime creation of doctrines and weapons, and furthering the cause of disarmament to the extent specific weapons are prohibited. To these six might be added a seventh and eighth – increased chances for the restoration of peace following armed hostilities, and, somewhat paradoxically, increased military efficiency by requiring the focused application of force. Beyond the numerous and well-documented violations in Kosovo, another

breakdown in order – seems ironic at best.²⁰¹ And yet although war is a breakdown with respect to peaceful dispute resolution, it becomes the *ultimate* breakdown only if allowed by its participants. War need not lead to anarchy or violent chaos, even though it necessarily entails injury, killing, and death.²⁰² Numerous historical examples of military discipline displayed in combat show that the participants in war can recognize order, or, at the very least a chain of command.

It is tautological to assert that effective warfare requires application of efficient, ordered methods. Indeed when that form of order represented by the law of war breaks down, the military effects can be disastrous. Colonel Dunlap quotes Richard Overy on the effects of Germany's disregard for the laws of war in its conflict against the Soviets on the Eastern front. Such "criminalization of warfare produced a growing indiscipline and demoralization among German forces themselves. The German army shot fifteen thousand of their own number, the equivalence [sic] of a whole division. . . . Desertion or refusal to obey orders increased as the war went on, and the law of the jungle seeped into

recent example highlights the wisdom of several of these factors. As armed hostilities between India and Pakistan have recently occurred in the Kashmir region, reports of torture marks on the bodies of six slain Indian soldiers have generated outrage among the Indian population. If true, these violations of the law of war have apparently provoked the very anger they are intended to minimize and will likely increase India's resolve to escalate the conflict. M. Ahmedullah, "India, Pakistan Inching Toward All-Out War" *The Chicago Tribune* (23 June 1999) 1.

²⁰¹ For some, "ironic" is the gentle way of putting it. Some authors express outright cynicism that the project of regulating warfare can ever succeed. Others provide examples leading to a measured skepticism over various aspects of the law of war. This skepticism can take the form either that military forces and their civilian leaders cannot be trusted to follow the law when war begins, or that the law simply does not regulate consistently. An example of the former relates to action at the First Hague Peace Conference to phrase principles of warfare restrictively subject to exceptions, rather than permissively subject to restrictions. As Hayes Parks notes, "[t]his is a manifestation of the fundamental distrust international lawyers have for things military, and a reluctance to permit battlefield commanders any latitude in situations that require a judgment call." H. Parks, "Air War and the Law of War" (1990) 32:1 A. F. L. Rev. 1 at 14, n. 54 [hereinafter Parks]. Regarding the latter form of skepticism, Doswald-Beck claims that the law's prohibition of certain forms of bullets without an unambiguous prohibition of nuclear weapons "creates skepticism regarding the seriousness of any of the law of war." L. Doswald-Beck, "Implementation of International Humanitarian Law in Future Wars" in M.N. Schmitt & L.C. Green, eds., *The Law of Armed Conflict: Into the Next Millennium*, International Law Series, vol. 71 (Newport, RI: Naval War College, 1998) 39 at 43.

²⁰² Those viewing war as necessarily barbaric, for reasons of strategy or otherwise, react coolly to the whole notion of rules, or moderation in war. Thus British Vice Admiral Sir John Fisher declared at the 1899 Hague Peace Conference that humanizing war was tantamount to humanizing hell. His suspicion at the law of war flowed from his view of the very nature of war. "What you call my truculence is all for peace. If you rub it in, both at home and abroad, that you are ready for instant war with every unit of your strength in the first line, and intend to be first in, and hit your enemy in the belly, and kick him when he is down, and boil your prisoners in oil (if you take any!), and torture his women and children, then people will keep clear of you." Quoted in Parks, *supra* note 201 at 13, n. 50.

the military structure itself.”²⁰³ Many factors contributed to the Nazi defeat, but the German way of war on the Eastern front failed at least in part because it became “disorderly.” Thus, advocacy for an efficient, effective military force can itself become an argument for the laws of war which will have the effect of reinforcing military discipline.²⁰⁴

Whatever the reasons, warfare has attended the human race since the beginning of recorded history. In reflecting on the phenomenon, theorists and scholars have described the nature of warfare in a variety of ways. Some see it as the logical and brutal extension of politics;²⁰⁵ others view warfare as principally about deception and avoidance of the enemy’s physical strengths.²⁰⁶ However one conceives warfare, all agree that armed combat is an event in which the battlefield reality is much worse than its mere description might suggest.²⁰⁷ Because of this, the principled warrior is the last to desire war; when

²⁰³ R. Overy, *Why the Allies Won* (London: Jonathan Cape, 1995) at 302-305 [quoted in Dunlap, “A Virtuous Warrior,” *supra* note 11 at 89].

²⁰⁴ Such an argument assumes a certain form of warfare that values and benefits from order. Theoretically, guerilla or terrorist tactics could eschew the type of “order” discussed here. But even these methods of warfare assume a certain level of coordination, planning, and thus order.

²⁰⁵ Carl von Clausewitz for example wrote that “war is not merely an act of policy but a true political instrument, a continuation of political intercourse, carried on by other means. What remains peculiar to war is simply the peculiar nature of its means. . . . The political object is the goal, war is the means of reaching it, and means can never be considered in isolation from their purpose.” C.V. Clausewitz, *On War*, trans. & eds., M. Howard, & P. Paret, (Princeton, NJ: Princeton University Press, 1976) 87 [hereinafter Clausewitz]. Elsewhere, Clausewitz specified that those “other means” are ugly: “If one side uses force without compunction, undeterred by the bloodshed it involves, while the other side refrains, the first will gain the upper hand. That side will force the other to follow suit; each will drive its opponent toward extremes, and the only limiting factors are the counterpoises inherent in war. . . . It would be futile – even wrong – to try and shut one’s eyes to what war really is from sheer distress at its brutality.” *Ibid.* at 75-76.

²⁰⁶ Thus ancient Chinese strategist Sun-Tzu “did not conceive the object of military action to be the annihilation of the enemy’s army, the destruction of his cities, and the wastage of his countryside. ‘Weapons are ominous tools to be used only when there is no alternative.’” Sun Tzu, *The Art of War*, trans. S.B. Griffith (London: Oxford University Press, 1963) at 40 [from the introduction]. The dichotomy between the approaches of Clausewitz and of Sun Tzu led B.H. Liddell Hart to write “Civilization might have been spared much of the damage suffered in the world wars of this century if the influence of Clausewitz’s monumental tomes *On War*, which moulded European military thought in the era preceding the First World War, had been blended with and balanced by a knowledge of Sun Tzu’s exposition on ‘The Art of War.’” *Ibid.* at v [from the forward].

²⁰⁷ One need only view two recent Hollywood productions, *Saving Private Ryan* and *The Thin Red Line*, to “experience” the horrors of war beyond the written word. In both cases, the films vividly portray the existential horrors of warfare (violent death, mutilation, betrayal, savagery, terror) through realistic reenactment. Yet even the film medium, powerful as it is, cannot reproduce the feelings experienced in war either by the combatant or the noncombatant. Beyond this, *Saving Private Ryan* in particular included reenactment of several violations of the law of war. In one case toward the end of the film, a young American soldier is shown killing a German soldier who had his hands in the air, and though taunting the American, had surrendered his weapon and intent to resist thus entitling himself to protection as a prisoner of war. Though the 1949 Geneva Convention (III) Relative to the Treatment of Prisoners of War had not

given the discretion, he reserves it as a last resort. Nonetheless, warfare has been a permanent fixture of the human race. As one source puts it “[a]ccording to estimates based on the period from 3600 B.C. until 1960, mankind has known only 292 years of universal peace, and in the remaining 5268 years has faced 14,513 armed conflicts taking 1240 million human lives.”²⁰⁸ These statistics highlight the fact that for the sake of preserving human life and international public order, one must accept, however cynically,²⁰⁹ both the importance and relevance of the laws of war.

A. Jus in Bello vs. Jus ad Bellum

When speaking of the various international norms limiting the prosecution of war, scholars have historically distinguished between the *jus in bello*, or, the laws regulating the conduct of states once armed conflict between them has begun,²¹⁰ and the *jus ad*

yet come into existence at the time of this depiction, the 1907 regulations annexed to the Hague Convention (IV) on land warfare had. These regulations, which governed the conduct of WWII, unambiguously required “humane” treatment for prisoners of war. The young American is portrayed as being the underdog having impotently witnessed the German lawfully, though agonizingly, killing an American compatriot just moments before. Perhaps the most troubling aspect of this scene is the unfortunate effect it will likely have on most American audiences. Rather than disgust at having witnessed a war crime, the screenplay appears designed to elicit a sense of euphoria that the younger, weaker American finally got the German. To the extent that the popular media manipulates public opinion in ways such as this, respect for the law of war is not engendered, but diminished.

²⁰⁸ E.J. Osmańczyk, “War” in *The Encyclopedia of The United Nations and International Relations*, 2nd ed. (New York: Taylor and Francis, 1990) at 1018. Horrible as it is, Malanczuk notes that war has not always been perceived as it is today. “It is hard to realize that during the eighteenth and nineteenth centuries most people (except for a few pacifists) regarded war in much the same way as they regarded a hard winter – uncomfortable, certainly, but part of the settled order of things, and providing excellent opportunities for exhilarating sport; even the wounded soldier did not regard war as wrong, any more than the skier with a broken leg regards skiing as wrong.” P. Malanczuk, *Akehurst’s Modern Introduction to International Law*, 7th rev. ed. (London: Routledge, 1997) at 308 [hereinafter Malanczuk, *Introduction to International Law*].

²⁰⁹ Despite Cicero’s oft-quoted maxim *inter arma silent leges* (lit. “in war the law is silent”), and professor Fenwick’s pessimistic candor (“it is futile to attempt to revive [the laws of war]. . . . Let’s face the facts. War has got beyond the control of law. . . . The sooner every man, woman and child old enough to think realizes that he will be a party to the next war, the better.” C.G. Fenwick, [transcript of oral response to W. Downey, Jr. “Revision of the Rules of Warfare”] (1949) 43 Proc. Am. Soc. I. L. 110.) the law of war has influenced the conduct of armed forces. Roberts and Guelff cite several international norms that have been observed principally because of the law of war including, humane treatment of prisoners, a state’s entitlement to neutral status, illegitimacy of certain targets, and that persons not active in the conflict should be spared from the consequences of the fighting to the extent possible. A. Roberts & R. Guelff, eds., *Documents on the Laws of War*, 2nd ed., from the Introduction (Oxford, UK: Oxford University Press, 1989) at 14 [hereinafter Roberts & Guelff].

²¹⁰ Because the law of war is a matter of public international law, and regulates the conduct of states relative to each other, it does not ordinarily regulate purely internal, “civil” wars. Nonetheless, certain regional agreements relate to internal conflicts. Further, Roberts and Guelff note that “customary international law provided that the laws of war might become applicable to a non-international conflict through the doctrine of ‘recognition of belligerency’ . . . [by which] the government of state in which an insurrection existed

bellum consisting of the law governing resort to armed conflict. The former law applies to conflicts that the belligerents themselves may not regard as “wars.”²¹¹ The latter law is of relatively recent origin and is expressed most authoritatively in Article 2(4), and Chapter VII of the United Nations Charter.²¹² Based on this distinction, Michael Walzer points out that the truly lawful war must satisfy both requirements: “War is always judged twice, first with reference to the reasons states have for fighting, secondly with reference to the means they adopt.”²¹³ This two-part analysis leads another publicist to distinguish between a war’s “*just cause* and [its] *just means*.”²¹⁴

Some authors conceive a conceptual framework in which the law of war concerns itself principally with the *jus in bello*. Thus, Kalshoven writes “[t]he laws of war, or *jus in bello*, are those rules and principles of international law which . . . govern the conduct of war.”²¹⁵ This is both the majority view and the better view. By contrast, others prefer to speak of the law of war as comprising *both* aspects. “The term ‘laws of war’ can have different meanings and refers to both the rules governing resort to armed conflict (*ius ad bellum*) and the rules governing the actual conduct of armed conflict (*ius in bello*).”²¹⁶

could recognize the belligerency of the insurgent faction, and the laws of war would thereby become applicable.” Roberts & Guelff, *supra* note 209 at 12. They further note that the doctrine of recognition of belligerency has fallen into decline, and that the surer basis for application of certain fundamental humanitarian provisions in non-international conflicts is Common Article 3 of the four 1949 Geneva Conventions. *Ibid.* at 13. Finally, while the 1977 Geneva Protocol II is intended to expand the provisions of Common Article 3, it too applies only during the existence of an “armed conflict.”

²¹¹ “[T]oday humanitarian law is applicable in any international armed conflict, even if the parties to that conflict have not declared war and do not recognize that they are in a formal state of war.” D. Fleck, ed., *The Handbook of Humanitarian Law in Armed Conflict* (Oxford, UK: Oxford University Press, 1995) 10 [hereinafter Fleck]. As Fleck uses the term, “international humanitarian law” is synonymous with the older phrase “law of war” (with the exception of the law of neutrality), the former including all rules designed to regulate the treatment of the individual – civilian or military, wounded or active – as well as rules governing the means and methods of warfare. *Ibid.* at 9.

²¹² See section C.4, *infra*.

²¹³ M. Walzer, *Just and Unjust Wars* (New York: Basic Books, 1977) at 21.

²¹⁴ T. Franck, *Fairness in International Law and Institutions* (Oxford UK: Clarendon Press, 1995) at 246 (emphasis in original) [hereinafter Franck]. Though Franck frames the distinction in moral categories (i.e. “just”), the context makes clear he is asserting that the early development of international *legal* norms mirrored those of the “just war” tradition – an ethical as well as a legal theory of warfare. Franck claims that this tradition held sway in Western societies as both a legal and ethical theory until the 1648 Peace of Westphalia ushered in an international order based on “a balance of power among sovereign nations [rather than] the ideal of a unified empire under God and right reason. This Westphalian system remained in place until the outbreak of war in 1914. Positivism largely banished notions of just war from the realm of law to the outer marches of moral philosophy.” *Ibid.* at 252.

²¹⁵ F. Kalshoven, “Laws of War,” in Bernhardt, ed., *Encyclopedia of Public International Law*, vol. 4 (Amsterdam: North-Holland Publishing Company, 1982) 316.

²¹⁶ Malanczuk, *Introduction to International Law*, *supra* note 208 at 306.

Because the term *jus ad bellum* more properly coincides with phrases such as “the right of self-defense” and “resort to the use of force,” it should therefore be distinguished from “laws of war.” Equating the *jus in bello* with the phrase “laws of war” is not only a matter of historical convention,²¹⁷ but of logical application of law to war. Simply put, the *jus ad bellum* is to be regarded as separate from the law of war because of the “cardinal principle that *jus in bello* applies in cases of armed conflict whether the conflict is lawful or unlawful in its inception under *jus ad bellum*.”²¹⁸

B. Customary Principles within the Law of war

Given the misery left by warfare through the centuries, warring nations have developed customary practices seeking to ameliorate its devastating effects. As the customs of war have evolved into the customs *and laws* of war, the dominant objective underlying the law as it relates to military force has remained constant and can be summed up in one word: restraint.²¹⁹ This was perhaps best summarized for the first time

²¹⁷ Arguably, prior to 1928 and execution of the Treaty of Paris (Kellogg-Briand Pact) which purported to outlaw warfare as a legitimate means of dispute resolution, there was no such thing as a *jus ad bellum*. While there were ethical principles relating to conditions for a “just war” and for self-defense, nothing approached the level of international law. Even the Treaty of Versailles, which took initial steps toward conditioning the use of force (e.g. Article 16 which made acts of war against any member of the League of Nations acts of war against all members), did not explicitly ban war itself. *Treaty of Versailles* 13 (Supplement, 1919) Am. J. Int. L. 2.

²¹⁸ Roberts & Guelff, *supra* note 209 at 1.

²¹⁹ This is subject to the clarification that while the law of war as a body of legal principles does work to *limit* the means and methods of warfare, those principles recognize that in the world of fact (versus legal principle) acts of combat exist and may even appear to be *allowed* by reference to the relevant legal principle. Some may view this reference to legal principles as *authorization*, as for example in this reference to the principle of military necessity [see *infra* section B.1. for a discussion of military necessity]: “I did X, an otherwise prohibited act, because it was militarily necessary.” But to view the law of war as *authorizing* or *enabling* behavior, misses a fundamental principle of international law. Professor Schmitt, author of the foregoing military necessity example, puts it best: “To exist as a principle of law, military necessity must have independent legal valence. That can, by definition, only occur when it is characterized as a limitation, for, as a general rule, all that is not prohibited in international law is permitted.” M.N. Schmitt, Book Review of *Law on the Battlefield* by A.P.V. Rogers (1997-1998) 8 USAFA J. L. Studies 257 [hereinafter Schmitt, Book Review of *Law on the Battlefield*]. This analysis applies to all principles and tenets of the law of war – thus all are restrictions on behavior. As for the general proposition in international law that all that is not forbidden is permitted, the International Court of Justice recently quoted from two previous cases, as it recounted the position of several states leading up to its advisory opinion on the threat or use of Nuclear Weapons. See *Advisory Opinion on Nuclear Weapons*, *supra* note 198 (referencing the *Steamship Lotus* and *Nicaragua* cases). In the *Steamship Lotus* case, the Permanent Court of International Justice stated that “restrictions upon the independence of States cannot . . . be presumed” and that international law leaves to states “a wide measure of discretion which is only limited in certain cases by prohibitive rules.” P.C.I.J. Series A, No. 10 at 18-19. Then more recently, the International Court of Justice stated that “in international law there are no rules, other than such rules as may be accepted by the State concerned, by treaty or otherwise, whereby the level of armaments of a sovereign state can be

in an international instrument by article 22 of the Second Convention adopted by the 1899 Hague Peace Conference: "The right of belligerents to adopt means of injuring the enemy is not unlimited."²²⁰ As discussed below, the dominant concepts distilled from the vast body of customary international law amount to very few; military necessity, discrimination, proportionality, and humanity.²²¹ These principles, recognized in subsequent treaty law, limit the means and methods available to belligerents for conducting armed conflicts, and thus each demands restraint of the belligerent State.²²² Because there are no treaties establishing specific *jus in bello* principles for space combat, these customary principles provide the most authoritative source, subject to the specific principles of space law discussed in Chapters Four and Five, on which the analysis of a *jus in bello* for space must proceed.

1. Military Necessity

Military necessity expresses the idea that for an attack to be lawful belligerents must be able to show the connection between the attack, and the suppression of the enemy's military capability. De Mulinen points out that military necessity justifies those measures: "(a) not forbidden by the law of war; and (b) required to secure the overpowering of the enemy."²²³ Implied in the restriction this principle imposes is the

limited." *Nicaragua v. United States of America*, I.C.J. Reports 1986 at 135, para. 269 [hereinafter *Nicaragua*]. Though the latter language specifically addressed armaments, it rests on the rationale from the *Steamship Lotus* case – unless prohibited, an action is allowed.

²²⁰ *Convention (II) with Respect to the Laws and Customs of War on Land*, 29 July 1899, (1907 Supplement) 1 A.J.I.L. 129 (entered into force 4 September 1900), reprinted in Schindler & Toman, *supra* note 198 at 82.

²²¹ These four principles are generally viewed as summarizing the customary law of war, though this enumeration is not accepted universally. Thus, Hayes Parks describes the concept of proportionality as subordinate to, and an expression of, discrimination. He argues that discrimination is attended today with some confusion "because of the attempted injection of the concept of *proportionality* into the law of war." Parks, *supra* note 201 at 5, n.18. By contrast, Professor Schmitt subordinates distinction to proportionality, and recognizes chivalry as a forth distinct customary principle. See M.N. Schmitt, "Green War: An Assessment of the Environmental Law of International Armed Conflict" (1997) 22:1 Yale J. Int'l L. 1 at 52 [hereinafter Schmitt, "Green War"]. Whatever the formulation however, each approach includes the relevant prescriptive norms as developed in customary law, while giving special emphasis to some but not others.

²²² As the subsequent analysis shows, the law demands such restraint whether the operation in question is offensive or defensive in nature.

²²³ F. De Mulinen, *Handbook on the Law of war for Armed Forces* (Geneva: International Committee of the Red Cross, 1987) 82 at 83. Perhaps subpart (b) of this formulation is the more important as subpart (a), simply invoking that which is not forbidden by the law of war, could apply to *any* principle of the law of war and says nothing unique about the restrictions imposed by military necessity.

requirement that attackers have identified the prospective target in advance of attack as one that is militarily legitimate. Put otherwise, the attacker must be convinced that attacking the target will contribute to the victory of his military undertaking. As the quote at the head of this chapter suggests, the more capable a belligerent is in properly identifying these militarily necessary targets, the more responsibility it has in doing so.

Taken to its logical extreme, the principle of necessity could be used to justify the very sorts of activity the laws of war prohibit.²²⁴ Any argument taking the principle to this extreme commits two legal errors. First, it fundamentally misinterprets the principle by failing to recognize the sovereign freedom states have in the absence of legal prohibition.²²⁵ Legally speaking, a state does not need concepts like military necessity to justify its behavior in war provided such behavior is otherwise compliant with applicable *jus in bello* restrictions. As Schmitt emphasizes, “[m]ilitary necessity operates within this paradigm to prohibit acts that are not militarily necessary; it is a principle of limitation, not authorization. In its legal sense, military necessity justifies nothing.”²²⁶ Second, as with all of the customary principles underlying the law of war, but especially military necessity, the concept must be balanced against the others. The U.S. Air Force stresses this point in its manual on the law of war.

The law of armed conflict has been shaped with a recognition of the concept of "military necessity." Hence "necessity" cannot be claimed as a defense to violations of absolute prohibitions included in the law of armed conflict, for example, killing of prisoners of war. More importantly, various military doctrines, such as accuracy of targeting, concentration of effort, maximization of military advantage, conservation of resources, avoidance of excessive collateral damage,

²²⁴ Such was the case in 19th Century Germany as expressed through the doctrine of *Kriegsraison*. This concept, an interpretation of the traditional notion of military necessity, asserted that military necessity “could justify any measures – even in violation of the laws of war – when the necessities of the situation purportedly justified it.” AFP 110-31, *The Conduct of Armed Conflict and Air Operations* (November 1976) at para. 1-3(a)(1) [hereinafter AFP 110-31]. Abuse of the principle continued into the twentieth century as Carnahan notes: “The modern denigration of military necessity goes back at least to the Nuremberg trials after World War II, where some defendants argued that military necessity justified their atrocities against civilian populations.” He continues that “military necessity is widely regarded today as an insidious doctrine invoked to justify almost any outrage. As a result, the principle has not been allowed to play the creative role that it is capable of playing.” B.M. Carnahan, “Lincoln, Lieber and the Laws of War: The Origins and Limits of the Principle of Military Necessity” (1998) 92:2 A.J.I.L. 213 at 230 [hereinafter Carnahan, “Lincoln, Lieber and the Laws of War”].

²²⁵ See *supra* note 219.

²²⁶ Schmitt, “Green War,” *supra* note 221 at 54.

and economy of force are not only fully consistent with compliance with the law of armed conflict but reinforce its observance.²²⁷

2. Discrimination

Discrimination,²²⁸ as the terms suggests, stresses diligence in “the selection of methods, of weaponry and of targets. . . it includes the idea of the immunity of non-combatants and those *hors de combat* [the sick, wounded, and shipwrecked], but it is not only about that: it can also refer to geographical and other limitations.”²²⁹ This description incorporates several concepts, one of the most significant being the distinction between combatants and non-combatants. In general, the law of war prohibits attack of any person deemed a “non-combatant.” This means that the lawfulness of the use of force against individuals under the *jus in bello* presupposes attack of those qualifying as combatants. Recognized at least since the nineteenth century,²³⁰ the law of war establishes the category “combatants” in order to specify those who may be attacked, but also to create a measure of protection for those so categorized.²³¹ The 1907 Regulations annexed to the Hague Convention (IV) Respecting the Laws and Customs of War on Land stated the general criteria for recognizing combatants: (a) Commanded by a person responsible for his subordinates; (b) have a fixed distinctive emblem recognizable at a distance; (c) carry arms openly; and (d) conducts operations in accord with the laws and customs of war.²³²

The care required by the principle of discrimination to distinguish between combatants and non-combatants rests on an even more fundamental principle: military

²²⁷ AFP 110-31, *supra* note 224 at para. 1-6(b).

²²⁸ Also termed “distinction.”

²²⁹ Roberts & Guelff, *supra* note 209 at 5.

²³⁰ Professor Green, quoting from a treatise dating to 1802, states that “[i]t is only with the writers of the nineteenth century that either a clear definition or the rights of soldiers or the first usage of the term ‘combatants’ is found.” L.C. Green, *The Contemporary Law of Armed Conflict* (Manchester, UK: Manchester University Press, 1993) at 101 [hereinafter Green].

²³¹ Thus, the law protects those combatants who are captured, wounded, sick, or shipwrecked. The “combatant” category also does not include every member of the military force, as for example chaplains and medical personnel.

²³² Article 1, reprinted in Roberts & Guelff, *supra* note 209 at 48. Those military members who should ordinarily fit this category but don’t for failure to comply with one of its terms, so as soldiers not wearing a uniform or concealing their weapons, become “unlawful combatants” and risk loss of protections afforded to lawful combatants.

objective.²³³ The latter principle requires that a belligerent's armed attacks be limited to targets that are military in nature, the destruction of which advances the attacker's tactical, operational, or strategic position. Such targets would certainly include combatants in action, as well as inanimate objects deemed necessary for the opponent's prosecution of the conflict. Thus, article 48 of the 1977 Protocol I to the 1949 Geneva Conventions provides the clearest statement of the customary principle, and assumes in its "basic rule" concerning the general protection of civilians populations that belligerents will recognize military objectives.

In order to ensure respect for and protection of the civilian population and civilian objects, the Parties to the conflict shall at all times distinguish between the civilian population and combatants and between civilian objects and military objectives and accordingly shall direct their operations only against military objectives.²³⁴

Subsequently, Protocol I defines "military objective" (relating to objects versus noncombatants) as being "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."²³⁵

The obligation created by the principle of distinction attends both the attacker and the defender.²³⁶ Further, because the principle requires attackers to exercise due care in the selection, engagement, and destruction of targets it imposes a duty commensurate with the belligerent's ability to discriminate. Given the lack of precision afforded by gravity-driven projectiles dropped from hot air balloons, the outright prohibitions on such

²³³ Admiral Robertson notes the fundamental character of the principle of discrimination, and thus of military objective, by reference to the International Court of Justice Advisory Opinion on Nuclear Weapons. There the court opined that military objective is one of the two "cardinal principles" of the law of armed conflict (the other being the prohibition on the use of weapons causing unnecessary suffering to combatants). H.B. Robertson, "The Principle of the Military Objective in the Law of Armed Conflict" (1997-98) 8 USAFA J. of L. Studies 35 (citing Advisory Opinion on Nuclear Weapons, *supra* note 198 at 28) [hereinafter Robertson].

²³⁴ *Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts*, 12 December 1977, 1125 U.N.T.S. 3, article 48 (entered into force 7 December 1978, US not a party), (1977) 16 I.L.M. 1391, (1978) 72 A.J.I.L. 457, reprinted in Roberts & Guelff, *supra* note 209 at 389 [hereinafter *Protocol I*].

²³⁵ *Ibid.* at art. 52(2). Though not adopted universally as a treaty rule, Admiral Robertson notes that Protocol I's provisions on military objective from articles 48 and 52 are widely incorporated into military manuals and are "recognized as a norm of customary international law." Robertson, *supra* note 233 at 44.

²³⁶ See *infra* note 285.

methods of war in 1899 and 1907 make sense in light of the principle of discrimination.²³⁷ However, the increasing capability of modern weaponry not only provides increased tactical options, but increased obligation as well. To the extent that a laser-guided bomb can be used to effectuate an attack that properly distinguishes legitimate from illegitimate targets, but a conventional gravity bomb cannot, the attacker is *obligated* to either forego the attack or use the less common, more costly precision munition.²³⁸

3. Proportionality

The customary rule of proportionality, more difficult to articulate than necessity or discrimination, requires that the use of military force be proportional to the legitimate military objective in view. This represents more than simply the principle of war advocating only such force as is necessary to attain the objective; it actually requires a balancing of anticipated military advantage against anticipated damage caused.²³⁹ It essentially prohibits the use of military force that creates collateral damage to civilians or property, not otherwise legitimate targets, that is disproportionate to the military value of the objective.²⁴⁰ As Roberts & Guelff point out, this doctrine can refer to two different situations: first, the proportionality of a belligerent response to a grievance (in this sense proportionality provides a link between the *jus ad bellum* and *jus in bello*); and second,

²³⁷ The underlying legal instruments effecting these prohibitions are referenced *infra* at notes 272 and 273 and accompanying text.

²³⁸ Schmitt states the matter well: "[The law of armed conflict] is no longer a body of law designed to ensure a fair fight between two opponents; . . . Today, the law of armed conflict is designed primarily to minimize suffering and prevent unnecessary destruction. This being so, belligerents are held to the standards to which they are capable of rising." M.N. Schmitt, "Bellum Americanum: The U.S. View of Twenty-First Century War and its Possible Implications for the Law of Armed Conflict" in M.N. Schmitt & L.C. Green, eds., *The Law of Armed Conflict: Into the Next Millenium*, International Law Studies, vol. 71 (Newport, RI: Naval War College, 1998) 389 at 412 [hereinafter Schmitt, "Bellum Americanum"]. The implication of this is that technological advancement comes at a cost; the more effectively weapons can avoid unnecessary destruction, the less ability belligerents legally have in allowing for the possibility of such destruction.

²³⁹ In this way, proportionality differs from the principle "economy of force." Schmitt, "Green War," *supra* note 221 at 55, n.267.

²⁴⁰ This principle not only governs the use of force during the ongoing operations of armed conflict, but during an act of self-defense under Article 51 of the *U.N. Charter* as well. See *infra* note 351. Thus, it is a "rule well established in customary international law" that in exercising its right to self-defense, a state may only use "measures which are proportional to the armed attack and necessary to respond to it." *Nicaragua*, *supra* note 219 at 94 (para. 176). The U.S. took that position that the lawfulness of an act of self-defense depends in part on the necessity and the proportionality of the measures taken. *Ibid.* at 103 (para. 194).

“proportionality in relation to the adversary’s military actions or to the anticipated military value of one’s own actions, including proportionality in reprisals.”²⁴¹

In the former sense of proportionality posed by Roberts & Guelff, the massive coalition military operation in the 1990-1991 Persian Gulf war would have been disproportionate to an unlawful border incursion and then an immediate retreat by the Iraqis. Though unlawful, such incursion could be remedied with far less force. In the latter sense of proportionality, in response to the opponent’s military actions, the destruction of a hydroelectric dam in order to eliminate a sniper perched on top would constitute an attack disproportionate to the legitimate objective of eliminating the threat posed by the sniper. Though the dam may be its own legitimate objective under certain circumstances, it is not made legitimate simply as a means of achieving the destruction of a far less significant target.

Because of the difficulty of applying the principle of proportionality to specific contexts in modern warfare, scholars and practitioners have devised tests to assist those engaging in target selection and military operations planning. One useful formulation for aerial combat has been advanced by Colonel Gómez of the Spanish Air Force: “an aerial attack expected to cause civilian casualties would be acceptable should it have the same degree of approval as a similar action taking place over a part of the country’s own territory under enemy occupation, in which case the civilian casualties would be compatriots.”²⁴² This formulation essentially asks the military planner to put himself in

²⁴¹ Roberts & Guelff, *supra* note 209 at 5. The concept of reprisals has proven controversial since the 1977 Geneva Protocol I sought to eliminate a form of reprisal taken against civilians or the civilian population. Professor Green explains that reprisals are “otherwise illegal measures taken in response to prior illegal measures of the adverse party and which are intended to cause the adverse party to cease its illegal activities and comply with the law. They are not measures taken simply by way of retaliation.” Green, *supra* note 230 at 331, 332 [hereinafter Green]. In stating that the U.S. decision not to ratify the Geneva Protocol I because of its narrowing of the right of reprisal, Abraham Sofaer pointed out that this factor was of concern to the U.S. Joint Chiefs of Staff and that it “would hamper the ability of the United States to respond to an enemy’s intentional disregard of the limitations established in the Geneva Conventions of 1949 or Protocol I.” A. Sofaer, “Agora: The U.S. Decision Not to Ratify Protocol I to the Geneva Conventions on the Protection of War Victims (Cont’d)” (1988) 82:4 A.J.I.L. 784 at 785. (Interestingly, Parks attributes the failure of the diplomatic conference to produce fundamental agreement among the delegations to the “cultural and philosophical differences that were substantially greater than they had been [at the Hague in 1907 and Geneva in 1949].” He further points out that many delegations were led by international lawyers lacking subject-matter expertise; “no delegation had a military officer of the stature of a Mahan, Fisher, or Rodgers.” Parks, *supra* note 201 at 76.)

²⁴² F.J.S. Gómez, “The Law of Air Warfare” (1998) 323 Int. Rev. Red Cross 347 at 354 [hereinafter Gómez].

the position of the enemy. Such an approach could be modified to apply the principle of proportionality to space warfare. Gómez aptly attributes the difficulty in applying the principle of proportionality to the subjectivity involved in the application, and thus terms the principle the "Achilles' heel of the law of war."²⁴³

4. Humanity

Finally, the concept of humanity incorporates several concepts, including that which is still called "chivalry."²⁴⁴ In practice, this principle may not pose the urgency it once did in limiting armed conflict because of the way the other principles have matured taking it into account. This is particularly true of necessity and proportionality, as Colonel Schmitt observes: "to the extent suffering is useless it is militarily unnecessary and, because it offers no direct and concrete military advantage, disproportionate."²⁴⁵

Nonetheless, the principle of humanity accounts for several efforts at outlawing means and methods of warfare deemed to cause unnecessary suffering. International law does not restrict belligerents from wounding or killing opposing forces so that they will not fight back. It follows from this that once a combatant is rendered *hors de combat* ("out of combat"), he is no longer a legitimate target for further attack. Thus, while it is legitimate to wound a combatant so as to render him *hors de combat*, means and methods of warfare having the effect of exacerbating wounds that would render a combatant *hors de combat*, are deemed "unnecessary." The principle has been applied over the centuries to weapons from antiquity, and those developed more recently that have been addressed through treaty instruments. These include poisoned weapons,²⁴⁶ barbed weapons, small-

²⁴³ *Ibid.*

²⁴⁴ In some formulations, chivalry receives attention as a separate customary principle. As it has developed in the law of war, chivalry distinguishes between acts of deception that undermine the goodwill of the enemy, and those that do not. Thus, acts of "perfidy" are always prohibited. As enumerated in Article 37 of Protocol I to the Geneva Conventions, these prohibited acts include the feigning an intent to negotiate under a flag of truce or of a surrender, feigning of an incapacitation by wounds or sickness, feigning of civilian or non-combatant status (such as marking of combat aircraft with the international symbols affording protection as medical aircraft), and feigning of protected status by the use of signs, emblems, or uniforms of the United Nations or of neutral states. By contrast, the law does not prohibit "ruses," such as the use of camouflage, decoys, mock operations, and misinformation, which deceive the opponent yet do not betray his confidence in measures requiring his goodwill and which are intended to ameliorate the effects of war. *Protocol I*, *supra* note 234, 1125 U.N.T.S. at 21, 22.

²⁴⁵ Schmitt, "Bellum Americanum," *supra* note 6 at 409.

²⁴⁶ As Carnahan notes, "[t]he ban on poisoned weapons is one of the oldest continuing prohibitions in the law of war." It predates any attempts at codification by centuries. B.M. Carnahan, "Unnecessary Suffering,

caliber incendiary or explosive bullets,²⁴⁷ expanding bullets,²⁴⁸ glass and other nondetectable fragments,²⁴⁹ and most recently, blinding lasers.²⁵⁰ In theory, prohibition of all of these weapons limits space war to the extent that any of them might be delivered against human beings from or within outer space.

As the principle of military necessity must be balanced by humanitarian concerns, some legal commentators note that humanitarian concerns must be balanced against legitimate military needs as well. The *jus in bello* principles presuppose that their application occurs in the midst of armed conflict – that is “*in bello*” – and that in some cases States will accurately assert a legal right to militarily subdue the other.²⁵¹ This

The Red Cross and Tactical Laser Weapons” (1996) 18 Loy. L.A. Int’l & Comp. L.J. 705 at 714 [hereinafter Carnahan, “Unnecessary Suffering”].

²⁴⁷ *Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grams Weight*, 11 December 1868, reprinted in (1907 Supplement) 1 A.J.I.L. 95, reprinted in Roberts & Guelff, *supra* note 209 at 30, Schindler & Toman, *supra* note 198 at 102.

²⁴⁸ These munitions have soft or hollow points so as to flatten on impact. Also called “dum-dum” bullets after the munitions factory near Calcutta India where first developed, they are outlawed by the Hague *Declaration (IV, 3) Concerning Expanding Bullets*, 29 July 1899, reprinted in Roberts & Guelff, *supra* note 209 at 40. The declaration explicitly applied to bullets “which expand or flatten easily in the human body, such as bullets with a hard envelope which does not entirely cover the core or is pierced with incisions.” *Ibid.* Though not a party to the *Declaration*, the United States has acknowledged that it will abide by the terms of the agreement. Carnahan, “Unnecessary Suffering,” *supra* note 246 at 720.

²⁴⁹ Protocol I to the 1980 Convention on Conventional Weapons prohibits the use of “any weapon the primary effect of which is to injure by fragments which in the human body escape detection by X-rays.” *Protocol [to the Convention on Conventional Weapons] on Non-Detectable Fragments (Protocol I)*, 10 April 1981, 1342 U.N.T.S. 7 (entered into force 2 December 1983), (1980) 19 I.L.M. 1523, reprinted in Roberts & Guelff, *supra* note 209 at 479, Schindler & Toman, *supra* note 198 at 185.

²⁵⁰ *Protocol [to the Convention on Conventional Weapons] on Blinding Laser Weapons (Protocol IV)*, 13 October 1995, (1996) 35 I.L.M. 1218. The International Committee of the Red Cross takes the prohibition of Protocol IV a step further in its 1995 pamphlet “Blinding Weapons,” and declares all “blinding as a method of warfare” to be a violation of international humanitarian law. Carnahan, distinguishing the ICRC’s denunciation of poison gas in 1925, notes that this “striking policy departure” marks the first time in history that the ICRC has “publicly denounced a specific method of warfare as a violation of international law.” Carnahan, “Unnecessary Suffering,” *supra* note 246 at 705. Carnahan concludes that by declaring the “undefined concept of ‘blinding as a method of warfare’ unlawful and making exaggerated claims for the destructiveness of lasers, the ICRC has helped to lay the basis for false war crime charges against any soldier captured with a portable laser. The ICRC may have compromised its own ability to prevent abuse of prisoners of war subjected to such charges.” *Ibid.* at 731. Although itself bordering on exaggeration, at least one important reminder can be taken from this conclusion – a very possible consequence of crusading against a means of warfare in the interest of soldiers may make the very soldiers in view more vulnerable. A final observation regarding this protocol outlawing blinding lasers relates to its prospective nature vis-à-vis the weapons at issue. This is one of the only attempts in the law of war to prohibit the use of a weapons system *before* it has been deployed in combat, or even fielded for training purposes prior to combat.

²⁵¹ For example, under Article 51 of the United Nations Charter states have the “inherent right” to use armed force in self-defense. *Infra* notes 351 & 356. This raises two fundamental issues. First, because the right is “inherent,” and has been recognized by customary international law long prior to the appearance of the *U.N. Charter* (at least since the Caroline incident, see D.J. Harris, *Cases and Materials on International*

forces the law to assume a pragmatic posture with respect to the goal that warfare remain humane. Thus, Professor Green rightly observes

Since the law of armed conflict rests upon a judicious balance between military operational needs and humanitarianism, and since the purpose of the Geneva Law is the preservation of humanitarianism accompanied by respect for civilians and the long-term interests of the parties to the conflict by reducing the possibility of sentiments of *revanchisme*, application of humanitarian principles does not override the needs of practical realism. Idealism and a belief in humanitarianism must not result in an automatic rejection of military needs or careless accusations of war crimes or crimes against humanity. However, the assessment of military needs must always be made in good faith.²⁵²

This is not to say that military necessity ever provides an authorization to act (as for example the following example might incorrectly suggest: “the employment of such and such military force was authorized because doing so was militarily necessary”), but simply to say that each of the customary law of war principles represent an important *limitation* on means and methods of warfare while simultaneously recognizing that warfare nonetheless persists in human experience. This fact affects the content that the law invests into the term “humanity.” This fact further pragmatically presupposes that unless the law somehow accommodates itself to such realities as the continued existence of war, states will ignore it. One can recognize the existence of such accommodation by observing the simple fact that unfettered humanitarianism does not characterize the law of war. If it did, then not only would such “law” never have achieved the force of law in the first place,²⁵³ but the *jus in bello* would prohibit all means and methods of war because

Law, 5th ed. (London: Sweet and Maxwell, 1998) at 894), the right existed *before* the law prohibited warfare as an aggressive instrument of national policy. Second, because the Charter speaks of this prerogative toward self defense as a “right,” it appears to be an explicit *authorization* to act in certain circumstances. Taken as an authorization, and coupled with the *jus in bello*, the reasonable implication of this understanding of Article 51 is that states not only have the right to self defense, but have the right to use armed force in self defense, and have the right to attack militarily necessary targets in proportionate, “humane” ways as long as such attacks are otherwise predicated on compliance with the *jus ad bellum*. Though this understanding borders on repudiation of the principle articulated in the *Steamship Lotus* case (states may act as they please unless prohibited by law, *supra* note 219) by suggesting that with respect to self defense the law plays an *authorizing* rather than merely prohibitive role, it is better seen as merely a limited exception to the Lotus rule rather than a direct challenge to it.

²⁵² Green, *supra* note 241 at 333.

²⁵³ Given the development of international law in this century, it is highly doubtful states would ever completely restrict themselves from resort to the use of force under any circumstances – the ultimate extension of pure humanity.

any one of them are apt to produce suffering to some extent. Pure humanitarianism would prohibit all suffering of any kind, as the law of war plainly does not.²⁵⁴ The principles therefore require constant balancing and readjustment. Each acts as a limit on permissible military activity so that no one principle obliterates the other.²⁵⁵

C. Treaty Law

Without doubt, the easiest means of determining international law is by reference to the explicit will of states as expressed in treaties. Though of minimal value for ascertaining specific principles applicable to space warfare, the relevant treaties do provide the general foundation from which a space law of war will spring. And, the four general principles of the law of war outlined above, reinforced within this treaty law, will apply to armed conflict in any combat environment.²⁵⁶

A discussion of relevant treaty law restraining armed conflict would not be complete without reference to several historical antecedents. The diplomatic conferences producing the Hague and Geneva conventions, and their progeny, followed several modest attempts to codify the *jus in bello*. One such attempt, reflected in the Lieber Code

²⁵⁴ It is for this reason that there is some danger of confusion in referring to the law of armed conflict as "humanitarian law." To the extent that the latter title evokes images of human rights law, the term "humanitarian," and the legal content it suggests, could be transposed improperly from the one subset of public international law to the other. This would fail to accord the term its rightful and more limited connotations as applied to human suffering as it functions within the context of the law of armed conflict. Put simply, "humanitarian" as used in human rights law does not necessarily mean "humanitarian" as used in the law of armed conflict. This does not mean the two bodies of law are strictly distinct, see, e.g., cites at *supra* note 198. It also does not at all mean that humanity in the law of war is a narrow concept. As Schmitt observes, as applied to protection of the environment in armed conflict, humanity assumes an extra-anthropocentric quality. In this way it can be seen as a broader concept than "humanitarian" as used in human rights law, and includes prohibition of "activities that are not so much inhumane as *inhuman*. They are acts we intuitively recognize as inherently wrongful regardless of the context in which they occur. In a sense, they are violative of the 'dictates of public conscience.'" Schmitt, "Green War," *supra* note 221 at 61.

²⁵⁵ Schmitt articulates a sequential analysis in determining whether a military course of conduct comports with the law. "1. Means: Do the methods or means selected to execute the attack violate the principles of distinction, humanity, or any specific prohibition of the law of armed conflict? 2. Target: Is the target a military objective? If so, is attack on this type of target specifically forbidden? If not, is the destruction of the target militarily necessary? 3. Result: Does the concrete and direct military advantage anticipated outweigh the collateral damage and incidental injury likely to result?" Schmitt, Book Review of *Law on the Battlefield*, *supra* note 219 at 276, n.24. This approach helpfully clarifies that each principle acts as a filter to weed out impermissible military acts while at the same time recognizing that these principles are not authorizations to act, but limitations on acts which might otherwise be lawful.

²⁵⁶ It should be remembered that the two basic treaty regimes represented by the Hague Conventions and the Geneva Conventions, do not purport to be the exhaustive sources for law of war restrictions. Though they

of 1863, so called for its author, Columbia University professor Francis Lieber, governed the prosecution of war for the Northern forces during the American Civil War. Promulgated by President Lincoln as General Order Number 100 for the Union Army, the code's 157 articles set forth standards for the prosecution of the war and treatment of Confederate troops.²⁵⁷ Broadly governing the conduct of forces in the field, the Code covered topics ranging from martial law and military jurisdiction to deserters, prisoners of war, spies, abuse of the flag of truce, assassination, and civil war.²⁵⁸ It also enunciated certain principles which later came to be regarded as classic principles of the law of war. For example, Article 14 defined military necessity as "those measures which are indispensable for securing the ends of war, and which are lawful according to the modern law and usages of war."²⁵⁹ Article 15 distinguished between armed enemies, which are always legitimate targets of destruction under the doctrine of necessity, and the unfortunate but unavoidable loss of "other persons." It proceeded to remind the forces that "[m]en who take up arms against one another in public war do not cease on this account to be moral beings, responsible to one another and to God."²⁶⁰

Though developed in the United States, the Lieber Code became widely read as expressing an emerging international law relating to restrictions imposed on combatants in armed conflict,²⁶¹ and it "strongly influenced the further codification of the laws of war and the adoption of similar regulations by other states."²⁶² Thus, in addition to influencing the codification of subsequent treaty law, it became the model for other

are to a large extent codifications of customary law, the latter remains as a viable source not only for circumstances unaddressed in the treaty law, but to govern the conduct of non-parties to the treaties.

²⁵⁷ *Instructions for the Government of Armies of the United States in the Field*, General Orders No. 100, 24 April 1863, reprinted in Schindler & Toman, *supra* note 198 at 3.

²⁵⁸ Interestingly, the code was drafted and promulgated in the midst of civil war, yet it governs the conduct of American forces in wars with foreign states, only briefly touching on the problem of civil wars, rebellion, and insurrection in Articles 149-157. In its discussion of civil wars, the code states that rules of regular warfare may be adopted by a legitimate government vis-à-vis a rebelling force for the sake of "humanity." Article 152. But if such rules are adopted, the code continues that the legitimate government in no way implies a "partial or complete acknowledgment of their [rebellious] government." The language on civil war suggests that while the code principally regulated American forces during the course of international conflicts, it was a pointed reminder to Union forces that they were in the midst of an illegitimate uprising.

²⁵⁹ *Ibid.* at 6.

²⁶⁰ *Ibid.*

²⁶¹ F. Münch, "War, Laws of, History" in *EPIL*, vol. 4, *supra* note 31 at 327.

²⁶² Schindler & Toman, *supra* note 198 at 3.

countries, including Prussia in 1870,²⁶³ the Netherlands in 1871, France in 1877, Serbia in 1879, Spain in 1882, Portugal in 1890, and Italy in 1896.²⁶⁴

Eventually, the Geneva Convention of 1864,²⁶⁵ the Petersburg Declaration of 1868,²⁶⁶ Protocol and Declaration of the Brussels Conference of 1874,²⁶⁷ and the 1880 Oxford Manual of the Laws and Customs of War²⁶⁸ took modest steps toward limiting the means and methods of warfare as well as ameliorating the suffering they cause. In each case, the restrictions on means and methods of war, as well as on treatment of combatants and noncombatants, provided the foundation for the international treaty norms still in force today.

1. Hague Conventions of 1899 (I-IV) and 1907 (I-XIV)

The conventions adopted in 1899 and 1907 at the Hague provide, to this day, the backbone of international regulation governing the means and methods of warfare. These 18 treaties attempted to fulfil four main purposes: first, they sought to identify those who may lawfully participate in war, and define the duties and rights of those individuals; second, they sought to regulate means and methods by which states could lawfully conduct warfare; third, they sought to describe the conditions and manner under which belligerents could bombard or besiege; and forth, they sought to regulate truces, capitulations and armistices, and the military government of occupied territories.²⁶⁹

²⁶³ Carnahan, "Lincoln, Lieber and the Laws of War," *supra* note 224 at 215.

²⁶⁴ Roberts & Guelff, *supra* note 209 at 7.

²⁶⁵ *Conditions for the Amelioration of the Condition of the Wounded in Armies in the Field*, 22 August 1864, reprinted in Schindler & Toman, *supra* note 198 at 279. This convention has been superseded by the 1949 Geneva Conventions.

²⁶⁶ *Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight*, 11 December 1868, reprinted in Schindler & Toman, *supra* note 198 at 101. This declaration is the first agreement among states prohibiting the use of specific weaponry in time of war. The provisions of the declaration were later incorporated into the 1899 and 1907 Hague Regulations.

²⁶⁷ *Final Protocol and Project of an International Declaration Concerning the Laws and Customs of War*, 27 August 1874, reprinted in Schindler & Toman, *supra* note 198 at 25. The provisions of the protocol, and the international declaration have been incorporated into the 1899 and 1907 Hague Conventions and Regulations.

²⁶⁸ *The Laws of War on Land*, 9 September 1880 (published by the Institute of International Law at Oxford, UK), reprinted in Schindler & Toman, *supra* note 198 at 35. Again, the influence of the Oxford Manual on the 1899 and 1907 Hague Conventions and Regulations are clear.

²⁶⁹ P.J. Cameron, "The Limitations on Methods and Means of Warfare" 9 A.Y.I.L. (Canberra: Australian National University, 1985) 252.

Because the laws of war were among the earliest parts of international law to be codified,²⁷⁰ it may seem that the original principles would contribute little to the regulation of space combat. This is true only in part. Though the Hague Conventions had nothing explicit to say, about aerial warfare, for example, several specific restrictions have been applied by extension. It is no surprise that the Conventions contemplate the means and methods of warfare then in existence. However, although nothing in the 1907 texts is directed toward space operations, articulation of the *jus in bello* for space warfare will require examination of the Hague Conventions – an examination analogous to that undertaken for aerial warfare. Just as principles from the Conventions have been stretched to limit means and methods of air war, a slightly broader reading of the primary texts could establish the emergence of a generalized *jus in bello* for space.

The first Hague conference of 1899 was convened at the behest of Russian Foreign Minister Count Mikhail Muraviev. By letter dated 11 January 1899, Muraviev proposed eight revisions to the law of war, only one of which would have indirect bearing on space combat: “3 . . . prohibition of the discharge of any kind of projectile or explosive from balloons or by similar means.”²⁷¹ Although balloons had seen minimal use in combat, and were even then principally employed for surveillance rather than bombardment, there was great speculation in the 1890s about the future uses of aerial vehicles in war. Muraviev’s third proposal found direct, formal expression in the conference’s first of four “declarations.”²⁷² Though limiting its prohibition to a period of five years, the following conference held in 1907 adopted the same declaration, in nearly identical terms.²⁷³

The 1907 declaration entered into force on 27 November 1909 and was to remain in force “extending to the close of the Third Peace conference.”²⁷⁴ As with its 1899 predecessor, the 1907 version applied not only to balloons, but to “new methods of a

²⁷⁰ Schindler & Toman, *supra* note 198 at vii (from the Introduction).

²⁷¹ As quoted in Parks, *supra* note 201 at 8.

²⁷² *Declaration (IV, 1) To Prohibit for the Term of Five Years the Launching of Projectiles and Explosives from Balloons, and Other Methods of a Similar Nature*, 29 July 1899, reprinted in Schindler & Toman, *supra* note 198 at 202.

²⁷³ *Declaration (XIV) Prohibiting the Discharge of Projectiles and Explosives from Balloons*, 18 October 1907, reprinted in Schindler & Toman, *supra* note 198 at 202.

²⁷⁴ *Ibid.* at 203.

similar nature.”²⁷⁵ As a result of the outbreak of World War I, the parties never convened a third peace conference. Thus, the 1907 Declaration is still formally in force today binding those states parties to it.²⁷⁶ However, subsequent State practice, and particularly adoption of rules of aerial warfare at the Hague in 1923, allowing for limited bombardment,²⁷⁷ doomed the outright prohibition on discharge of explosives expressed in the 1907 Declaration. It is now generally regarded as having no legal significance.²⁷⁸

The more significant developments for airpower, and thus possibly spacepower, were the restrictions on bombardment contained within the fourth Convention regulating land warfare,²⁷⁹ and the ninth Convention regulating bombardment by naval forces.²⁸⁰ As with most of the documents adopted by the 1907 conference, the Convention on land warfare was drafted using terms and concepts from its 1899 predecessor.²⁸¹ Both conferences sought to limit the permissible scope of artillery fire and the “bombardment” resulting therefrom. Although the ninth Convention only limited bombardment by “naval forces,”²⁸² its second article provided a list of authorized targets, including “[m]ilitary works, military or naval establishments, depots of arms or war *matériel*, workshops or plant which could be utilized for the needs of the hostile fleet or army, and the ships of

²⁷⁵ *Ibid.*

²⁷⁶ The list of states parties include several significant airpower states, later active in outer space including: China, Great Britain, The Netherlands, and the United States. However, because the Declaration was only binding in cases of war between parties to it, it did not factor in either World War I or II.

²⁷⁷ *Hague Rules of Aerial Warfare*, (1923, supplement) A.J.I.L. 245, reprinted in Roberts & Guelff, *supra* note 209 at 121.

²⁷⁸ Parks, *supra* note 201 at 17. Schwarzenberger advances a plausible legal argument for why the 1907 rule no longer obligates States Parties: “at the time when the binding character of the declaration was limited to the close of the Third Hague Peace Conference, the conference was generally expected to be convened in 1914. As a matter of fact, the Peace Conference never took place. The efforts made in 1922 and 1923 by the International Commission for Revision of Rules of Warfare which, in this field, could be regarded as an equivalent, were abortive. Thus, it would not be unreasonable to consider that, in accordance with the *clausula rebus sic stantibus*, the Declaration of 1907 ceased to be in force and all parties regained the freedom of action which they could otherwise claim, with regard to bombardment from the air.” G. Schwarzenberger, “The Law of Air Warfare and the Trend Towards Total War” (January 1959) 8:1 Am. U. L. Rev. 1, 3-4.

²⁷⁹ *Convention (IV) Respecting the Laws and Customs of War on Land*, 18 October 1907, (1908 Supplement) 2 A.J.I.L. 90 (entered into force 26 January 1910), reprinted in Roberts & Guelff, *supra* note 209 at 44; Schindler & Toman, *supra* note 198 at 69.

²⁸⁰ *Convention (IX) Concerning Bombardment by Naval Forces in Time of War*, 18 October 1907, (1908 Supplement) 2 A.J.I.L. 146 (entered into force 26 January 1910); reprinted in Roberts & Guelff, *supra* note 209 at 94; Schindler & Toman, *supra* note 198 at 812.

²⁸¹ Though still in force today, the fourth convention of 1907 lost the support of eighteen states which were parties to the 1899 second convention. These eighteen states or their successors (e.g. Yugoslavia) remain formally bound by the 1899 convention.

war in the harbor. . . .”²⁸³ Because these targets were specifically excluded from the Convention’s prohibitions on bombardment, including its application to “naval forces,” it appears that the Convention recognizes that these targets could be attacked by any forces – naval, terrestrial, aerial, or even space.

A second feature of significance, from the ninth Convention, relates to its article 2 and the concept of unavoidable collateral damage. After requisite precautions have been taken by the attacker, including ascertaining the status of the target, issuance of a summons followed by a reasonable time of waiting, and failure by the local authorities to destroy the targets themselves, the attacker is absolved of responsibility for “unavoidable damage.”²⁸⁴ Significantly, this places a burden to minimize collateral damage not only on the attacker, but on the defender as well. Although reflected in subsequent international instruments, this aspect of the law of war is increasingly forgotten. In 1907 it was simply “realized that collateral civilian casualties were regarded as the cost of war to a nation rather than the responsibility of the attacker.”²⁸⁵ This general principle will apply equally to space warfare. Thus, belligerents employing military space assets that constitute legitimate targets will be obliged to separate them from other space objects not supporting the armed conflict.

In contrast to the ninth Convention on naval forces, the prohibition on bombardment in the regulations annexed to the fourth Convention did not limit itself to land forces. Reflecting the principle previously articulated in the second 1899 convention, the fourth convention’s general prohibition reads: “The attack or bombardment, by whatever means, of towns, villages, dwellings, or buildings which are

²⁸² *Ibid.* at art. 1, reprinted in Roberts & Guelff, *supra* note 209 at 95.

²⁸³ *Ibid.* Perhaps the most significant aspect of this list is its inclusion of industrial targets with military value. For the first time, this was explicitly recognized by an international instrument. Nonetheless, the entire list was regarded by the head of the U.S. delegation as simply declaratory of customary international law. Parks, *supra* note 201 at 18.

²⁸⁴ Convention IX, art. 2, reprinted in Roberts & Guelff, *supra* note 209 at 95.

²⁸⁵ Parks, *supra* note 201 at 18. Parks further concludes that the rule of article 2, convention IX was declaratory of customary law. Thus, however provocative such a claim may sound today, its roots go back to the codified foundations of the law of war, and beyond. This point about the legal obligations of the defender is a theme Parks sustains throughout his monumental, book-length article. The piece provides an excellent scholarly argument, citing to the provisions of both Hague and Geneva law, for the proposition that defenders bear as heavy an obligation to ameliorate the possibility and effects of collateral damage from air warfare as do attackers.

undefended is prohibited.”²⁸⁶ Although the drafters of the Convention did not likely envision space warfare, this provision raises three potential issues related to limitations on space warfare. First, the specified targets require at a minimum that they be “defended” before making them subject to attack. This was an early way of restating the principle of military necessity. That is, unless a potential target was considered significant enough to defend, it was not deemed significant enough to attack as a legitimate objective.

A second issue raised by the bombardment prohibition relates to its scope. Applicable to bombardment “by whatever means,” the prohibition against attack of undefended land targets restricts all bombardment of such targets, however or wherever originated. Unless properly defended, the enumerated targets were not to be engaged by land or sea forces. Given the expansive terms used by the drafters, the prohibition could be interpreted to apply by extension to air and space forces.²⁸⁷

Finally, the prohibition implicitly recognizes that under proper conditions certain targets are lawful. Thus, under the terms of the convention, one could not state that towns, villages, dwellings, or buildings may *never* be lawful targets. There were cases envisioned in which even towns filled with civilians could be bombarded. Significantly however, the Convention did not state that a potential target was legitimate simply because it was defended, only that undefended targets were off-limits. As a result, even a defended target may still have been protected if it did not otherwise qualify as a legitimate military objective. Just because a town full of civilians possessed armed protection, it was not thereby rendered a legitimate target unless it sustained an industrial or other function contributing to the prosecution of the conflict.

Chapter One of the regulations to the fourth Convention raises further distinctions that would prove important to all subsequent law of war rules.²⁸⁸ It defined the conditions under which one qualified as a “belligerent” and thus protection as a “prisoner of war” if

²⁸⁶ Convention IV, art. 25, reprinted in Roberts & Guelff, *supra* note 209 at 53.

²⁸⁷ Though the drafters of the convention could not have specifically foreseen the technological revolution in military affairs that would come later in this century, the absolute terms “whatever means” would seem to include means of bombardment from unanticipated new combat environments such as outer space. As for targeting from the air, the Greco-German Mixed Arbitral Tribunal held that the Convention IV rules relating to bombardment specifically applied to air warfare. *Coenca Bros. v. Germany* (1927) 7 M.A.T. 683 (quoted in Green, *supra* note 230 at 173).

²⁸⁸ As with most provisions of the forth 1907 convention, this one came substantially from the second 1899 convention. See Schindler & Toman, *supra* note 198 at 75.

taken during the course of hostilities. As listed previously, the regulations establish four criteria defining a belligerent²⁸⁹ which designation could apply not only to those in armies, but to militia members and those of volunteer corps as well. Chapter One further specifies that the category "belligerents" may include either combatants or non-combatants.²⁹⁰ As the term suggests, combatants refer to those participating directly in the hostilities. As a rule, members of a State's armed forces are combatants, with the two basic exceptions being religious and medical personnel. These two categories of soldiers, though members of the armed forces and otherwise entitled to protection as "belligerents" or "prisoners of war," are non-combatants because they may not participate directly in the use of force.

Even more basic than the distinction between "combatants" and "non-combatants" was that between "combatants" and "civilians."²⁹¹ Civilians were viewed as a special class of "non-combatants" (unable to take part in the hostilities), that were not "belligerents" (susceptible to capture and incarceration as prisoners of war) either. Neither they nor their property could be targeted directly as long as they retained their status as "civilians." However, a final important category, "unlawful combatants" applies to those non-combatants and civilians who are unauthorized to engage in hostilities, but do so nonetheless. These individuals lose the protection they would otherwise enjoy under the laws of war. As the 1977 protocol (I) to the Geneva Convention recognizes, unlawful combatants do not lose all humanitarian protections,²⁹² but they are not accorded "prisoner of war" status if captured, and they face lawful penal consequences by the foreign belligerent state for their unlawful participation in the conflict.²⁹³

²⁸⁹ See *supra* note 232 and accompanying text.

²⁹⁰ Article 3, reprinted in Schindler & Tomas, *supra* note 198 at 75.

²⁹¹ K. Ipsen, "Combatants and Non-Combatants" in Fleck, *supra* note 211 at 66.

²⁹² Article 75(1) of Protocol (I) specifies that "persons who are in the power of a Party to the conflict and who do not benefit from more favorable treatment under the Conventions or under this Protocol [i.e. prisoners of war; refugees and stateless persons] shall be treated humanely in all circumstances and shall enjoy, as a minimum, the protection provided by this Article without any adverse distinction based upon race, color, sex, language, religion or belief, political or other opinion, national or social origin, wealth, birth or other status, or on any other similar criteria." Roberts & Guelff, *supra* note 209 at 431.

²⁹³ The category "unlawful combatants" does not include those "combatants" who use means and methods of armed conflict that are violative of the *jus in bello*. These offenders may be "war criminals," and they may be prosecuted under international law or the domestic law of the opposing belligerent, but they are not what has traditionally been known as "unlawful combatants." Further, contrary to the impression left by some in the television and print media following the abduction of three U.S. soldiers in Macedonia recently, prisoners of war may be tried under certain conditions. However, as article 99 of the third 1949 Geneva

One additional category recognized by the Hague regulations merits attention – spies. This class of participants to the conflict includes those who, “acting clandestinely or on false pretenses, ... obtains or endeavors to obtain information in the zone of operations of a belligerent, with the intention of communicating it to the hostile party.”²⁹⁴ This does not include soldiers who have penetrated the hostile force’s zone of operations for the purpose of obtaining information.²⁹⁵ As applied to space warfare, this might mean that a combatant who enters an opposing spacecraft cannot be considered a spy as long as his vessel bears its prescribed distinctive markings, and the astronaut wears his military uniform. Because of potentially damaging, serious effects that spies can have on a belligerent, spies enjoy the least protection under international law and are the most vulnerable if captured. Spies are not deemed prisoners of war and, subject to various minimal due process protections, may be tried by hostile belligerents for espionage.²⁹⁶ In the near future however, spying is unlikely to become a significant issue for space warfare unless current trends toward unmanned missions change course. For ground operations in support of space warfare however, the traditional norms governing spying will apply.

2. Geneva Conventions of 1949 (I-IV) and Protocols of 1977 (I-II)

The 1949 Geneva Conventions serve primarily as protection for individuals suffering as a result of armed conflict. Those employing the term “humanitarian law” as the preferred reference for the law of war, often seem to have the Geneva Conventions principally in view. This follows from the simple observation that the 1949 Conventions protect the international interest in ensuring that warfare respects the human person to the maximum possible extent.²⁹⁷

Convention specifies, this cannot be for any “act which is not forbidden by the law of the Detaining Power or by international law, in force at the time the said act was committed.” Roberts & Guelff, *supra* note 209 at 254.

²⁹⁴ Article 29, reprinted in Roberts & Guelff, *supra* note 209 at 53.

²⁹⁵ *Ibid.* at 54.

²⁹⁶ This was most recently reiterated by Article 46 of Protocol I to the Geneva Conventions, reprinted in Roberts & Guelff, *supra* note 209 at 413.

²⁹⁷ Of course, the rules embodied in the Hague law are equally “humanitarian” and equally concerned with protection of the person. However, because the Geneva law explicitly provides for the “sick,” “wounded,” “shipwrecked,” “prisoners” it is more often thought of as the fullest expression of “humanitarian law.”

During World War II, following numerous violations of the laws of war,²⁹⁸ the world expressed great doubt that the laws of war would ever truly protect either combatants or civilians.²⁹⁹ This sense was expressed by Winston Churchill after the war: "The only direct measure of defence on a great scale was to possess the power to inflict simultaneously upon the enemy as much damage as he himself could inflict."³⁰⁰ This is to say that the laws of war were no "defense" against the indiscriminate use of force. Thus, to the extent that Churchill spoke for the general temper of his time, compliance with the laws of war was simply viewed as incidental to the prosecution of the war. If an international rule were adhered to, it was not for respect of the "law," but because doing so afforded some military advantage.

Out of this pessimistic environment emerged the diplomatic conference in Geneva, charged with limiting the harsh effects of war. Primarily concerned as they are with amelioration of the suffering of war victims, the four Geneva conventions are only tangentially related to regulating the means and methods of war. They represent, as has been said, "Geneva Law" related to victims, and not "Hague Law" related to means and methods of warfare. Nonetheless, several provisions do limit means and methods, specifically targeting options.

Article 19 of the Geneva Convention (I) for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field specifies that "Fixed establishments and mobile medical units of the Medical Service may in no circumstances be attacked, but shall at all times be respected and protected by the Parties to the conflict."³⁰¹ Under Article 22, this protection for medical facilities applies even if the unit's personnel are armed, the unit is protected by a fence or armed sentries, small arms and ammunition taken from the wounded and sick remain in the unit, the unit's services include veterinary

²⁹⁸ Two examples include the saturation bombing of civilian populations centers, and certain "indiscriminate" naval bombardments. Roberts & Guelff, *supra* note 209 at 93.

²⁹⁹ Hayes Parks suggests that international lawyers of that era even doubted the *applicability* of the law of war to modern warfare and particularly to aerial bombardment! Parks, *supra* note 201 at 50.

³⁰⁰ *Ibid.* (quoting M. Gilbert, *Winston S. Churchill: The Prophet of Truth, 1922-1939* (London, 1976) at 573).

³⁰¹ *Geneva Convention (I) for the Amelioration of the Condition of Wounded and Sick in Armed Forces in the Field*, 12 August 1949, 75 U.N.T.S. 31, 6 U.S.T. 3114, T.I.A.S. 3362 (entered into force 21 October 1950); Article 19, reprinted in Roberts & Guelff, *supra* note 209 at 179.

care, or the unit extends care to civilian wounded or sick.³⁰² These provisions clearly remove medical facilities from the list of permissible targets that belligerents may lawfully destroy. The fact that the prohibition contemplates “no circumstances” under which such targets may be attacked, signifies the comprehensive nature of the protection and forbids attack from any combat environment, including space.

A similar provision can be found in article 18 of the Geneva Convention (IV) Relative to the Protection of Civilian Persons in Time of War: “Civilian hospitals organized to give care to the wounded and sick, the infirm and maternity cases, may in no circumstances be the object of attack, but shall at all times be respected and protected by the Parties to the conflict.”³⁰³ Though this provision would also apply to space attacks, using the same absolute (“no circumstances”) language of convention (I), article 18 goes the step further by requiring belligerents to clearly mark civilian hospitals so that they are “clearly visible to the enemy land, air, and naval forces in order to obviate the possibility of any hostile action.”³⁰⁴

In addition to protection of medical facilities on the ground, Geneva law protects medical ships under the Geneva Convention (II) for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea. Thus, Article 22 provides that such ships, “that is to say, ships built or equipped by the Powers specially and solely with a view to assisting the wounded, sick and shipwrecked, to treating them and to transporting them, may in no circumstances be attacked. . . .”³⁰⁵ Article 23 clarifies that such protection extends to such support establishments ashore that may be protected under convention (I),³⁰⁶ and Article 28 protects the sick-bays aboard a warship,

³⁰² *Ibid.* at 180. Because the convention by its title purports to protect “armed forces in the field,” the inclusion of the last circumstance seems particularly odd. Not only are civilians non-combatants, they are non-belligerents. Positing that a protected facility does not lose its protection merely by virtue of the presence of a wounded civilian, seems to state the obvious.

³⁰³ *Geneva Convention (IV) Relative to the Protection of Civilian Persons in Time of War*, 12 August 1949, 75 U.N.T.S. 287, 6 U.S.T. 3516, T.I.A.S. 3365 (entered into force 21 October 1950); (1956) 50 A.J.I.L. 724, reprinted in Roberts & Guelff, *supra* note 209 at 278.

³⁰⁴ *Ibid.* at 279. The reference to “land, air, and naval forces” appears intended to highlight that the prohibition applies to all combat environments.

³⁰⁵ *Geneva Convention (III) Relative to the Treatment of Prisoners of War*, 12 August 1949, 75 U.N.T.S. 135, 6 U.S.T. 3316, T.I.A.S. 3364 (entered into force 21 October 1950); (1953 Supplement) 47 A.J.I.L. 119, reprinted in Roberts & Guelff, *supra* note 209 at 202.

³⁰⁶ *Ibid.*

even where fighting occurs on board the ship.³⁰⁷ These provisions further restrict the potential methods of space warfare as all protected facilities could in theory be attacked from space.³⁰⁸

Motivated by continuing international conflicts, and particularly the revitalized interest in the law of war following the Vietnam war, nongovernmental organizations began advocating a diplomatic conference to update the law of war. This followed moves immediately after the second world war by the International Committee of the Red Cross (ICRC) attempting to restrict permissible instances of aerial bombardment. This emphasis on the need to update the law of war, continued through the 1950s and 1960s. Following two significant UNGA Resolutions,³⁰⁹ a diplomatic conference was convened in 1974 to draft new protocols.

³⁰⁷ *Ibid.* at 203.

³⁰⁸ Indeed, protected *persons* are also potentially subject to attacks from space. Thus, to the extent that the Geneva Conventions protect individuals from attack, they restrict space warfare. One example pertains to the prohibitions on taking reprisals against prisoners of war, Convention (III), Article 13, reprinted in Roberts & Guelff, *supra* note 209 at 222; and civilians, Convention (IV), Article 33, *ibid.* at 284.

³⁰⁹ These Resolutions not only further empowered the ICRC to justify the need for a diplomatic conference, but represented early disposition of the majority of States to the conference on a few subjects that would later become controversial. The first resolution, "Respect for Human Rights in Armed Conflicts," invited the U.N. Secretary-General, in conjunction with the ICRC, to study steps for better application of existing humanitarian conventions and to study the need for additional conventions. See *Respect for Human Rights in Armed Conflicts*, 19 December 1968, G.A. Res. 2444 (XXIII), U.N. GAOR, 23rd Sess., Supp. No. 18, U.N. Doc. A/7218 (1969) 50, reprinted in Schindler & Toman, *supra* note 198 at 263. Adopted by unanimous vote of 111 votes to none. More importantly, this Resolution affirmed three principles, stated in a prior ICRC Resolution, as follows: "(a) That the right of the parties to a conflict to adopt means of injuring the enemy is not unlimited; (b) That it is prohibited to launch attacks against the civilian population as such; (c) That distinction must be made at all times between persons taking part in the hostilities and members of the civilian population to the effect that the latter be spared as much as possible;" *Ibid.* As displayed by the vote, these principles were not controversial as a restatement of customary international law. The larger issue raised by the Resolution was the use of human rights language to describe what were historically law of war restrictions. Although the identification of human rights with humanitarian law has become increasingly prevalent in the scholarly literature following publication of documents such as Resolution 2444, it remains to be seen whether this is good for the law of war. While human rights law has traditionally been rooted in philosophy and politics, the law of war is rooted in military exigency. As a consensus grows for centralized punishment of violations within both bodies of law, as envisaged by the International Criminal Court, one sincerely hopes that the unseemly politicization often characterizing state rhetoric announcing human rights concerns does not infect the quest for a robust, enforced law of war. If the latter succumbs to petty world politics, it may be largely due to the blurring of the humanitarian law of war aimed at the focused restricting of suffering during armed conflict, with human rights law aimed at far broader issues and concerns. Following this by two years, the U.N.G.A. adopted Resolution 2675, "Basic Principles for the Protection of Civilian Populations in Armed Conflicts," *Basic Principles for the Protection of Civilian Populations in Armed Conflicts*, 9 December 1970, G.A. Res. 2675 (XXV), U.N. GAOR, 25th Sess., Supp. No. 28, U.N. Doc. A/8028 (1971) 76, reprinted in Schindler and Toman, *supra* note 198 at 267. Adopted by 109 votes to none, with 18 states abstaining or absent. In two cases, the eight provisions of Resolution 2675 restated the substance of provisions already stated in Resolution 2444.

The first of the two Protocols adopted by the conference pertained to international armed conflicts and is, to the extent that any law of war treaties will be relevant, more important for regulation of means and methods of space warfare. Protocol II limits itself to the regulation of armed force in “non-international armed conflicts,” relates to the protection of victims of “internal” or “civil” wars, and governs the protection of the victims of such conflicts.³¹⁰ Substantively, the provisions of Protocol II, which are significantly fewer and “far less restrictive”³¹¹ than those of Protocol I, supplement the provisions of common Article 3 of the Geneva Conventions – the latter requiring that minimal protections be accorded the victims of armed conflicts “not of an international character.”³¹² Traditionally, the customary law of war applied to non-international conflicts only if the government of a country in which the insurrection occurred, or some third State, chose to recognize the legal status of the insurgent group.³¹³ Because Protocol II, Article 1(2), excludes application of its terms for “situations of internal disturbances and tensions, such as riots, isolated and sporadic acts of violence and other acts of a similar nature ...,”³¹⁴ and such exclusions in the Geneva Conventions have been the basis for governments routinely denying the application of common article 3,³¹⁵ it is doubtful that Protocol II will have much impact on the amelioration of human suffering caused by non-international armed conflicts.

Potentially more important for the regulation of means and method of space warfare are the provisions of Protocol I. Though formally a protocol to the Geneva Conventions, Protocol I includes regulation of military activity previously governed by “Hague law.” Despite the innovations worked by Protocol I’s positions on insurgents

Otherwise, Resolution 2675 exhorted states to respect civilian populations and property by exempting them from attack, and reemphasizes the human rights rationale for such protections. In some cases the provisions restated concepts existing in the Geneva Conventions, and in all cases, the Resolution “restates rules of international law.” From the Introductory Note by Schindler and Toman, *ibid.* Interestingly, regarding civilian property, the Resolution states that “[d]wellings and other installations that are used only by civilian populations should not be the object of military operations.” *Ibid.* at 268. Implicitly, this affirms that unless such property is used exclusively by civilians (“only by”), it may be subject to attack if not otherwise protected on some other ground.

³¹⁰ Roberts & Guelff, *supra* note 209 at 447.

³¹¹ *Ibid.* at 448.

³¹² *Ibid.* at 172, 195, 217, & 273.

³¹³ *Ibid.* at 447.

³¹⁴ *Ibid.* at 450.

³¹⁵ *Ibid.* at 448.

and reprisals,³¹⁶ the United States found its greatest difficulty with the general thrust of provisions relating directly the conduct of military operations – articles 48 to 58.³¹⁷ Those articles define, *inter alia*, the basic rule of distinction,³¹⁸ the meaning of “attack,”³¹⁹ the meaning of “civilians” and “civilian population,”³²⁰ the rule protecting civilian populations,³²¹ the rule protecting civilian objects,³²² the rule protecting cultural objects and places of worship,³²³ the rule protecting objects indispensable to the survival of the civilian population,³²⁴ the rule protecting the natural environment,³²⁵ the rule protecting works and installations containing dangerous forces,³²⁶ the rule establishing necessary precautions to be taken in the event of attack,³²⁷ and the rule establishing

³¹⁶ Article 1(4), addressing the “General Principles and Scope of Application” of the entire protocol, proclaims that “The situations referred to in the preceding paragraph include armed conflicts in which peoples are fighting against colonial domination and alien occupation and against racist regimes in the exercise of their right of self-determination, as enshrined in the Charter of the United Nations and the Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations.” Roberts & Guelff, *supra* note 209 at 390. This means that insurgents opposing “colonial domination ... alien occupation ... and racist regimes in the exercise of their *right* of self-determination” (emphasis added) were to be accorded the full protections of the *jus in bello*, including limits on the state’s means and methods of subduing the insurgents militarily. This provision alone proved too difficult politically for some states to accept. (States *not* having ratified the Protocol as of 2 March 1999 include: Afghanistan, Andorra, Azerbaijan, Bhutan, Fiji, France, Haiti, India, Indonesia, Iran, Iraq, Ireland, Israel, Japan, Kiribati, Lithuania, Malaysia, Monaco, Morocco, Myanmar, Nepal, Nicaragua, Pakistan, Papua New Guinea, Philippines, Singapore, Somalia, Sri Lanka, Sudan, Thailand, Tonga, Trinidad and Tobago, Turkey, Tuvalu, and the U.S.A.) Another provision difficult to accept for some States, including the US, related to the concept of reprisals. Articles 51(6), 52(1), and 54(4), prohibit reprisals under any circumstances against the civilian population, against civilian objects, and against objects indispensable to the survival of the civilian population, respectively. Roberts & Guelff, *supra* note 209 at 416-417. Parks claims that the first two provisions were not a codification of customary law, but a reversal of it. (See Parks, *supra* note 201 at 94. He further states that flawed legal analysis of the doctrine of reprisals often results from confusion of the concept with others such as retaliation, revenge, or legitimate acts of self-defense. *Ibid.*) Customarily, civilian individuals and property could be threatened and attacked as a lesser evil in order to avoid a greater evil, and to promote respect for the law of war. Though reprisals are politically sensitive because they entail commission of an otherwise illegal act in order to suppress other illegal acts, they have proven effective historically in deterring violations of the *jus in bello*. *Ibid.* at 95. Parks cites as an example the threat by U.S. President Roosevelt to use chemical weapons as sufficient warning to deter Nazi use of such weapons.

³¹⁷ Parks, *supra* note 201 at 112.

³¹⁸ Article 48, reprinted in Roberts & Guelff, *supra* note 209 at 414.

³¹⁹ Article 49, *ibid.*

³²⁰ Article 50, *ibid.* at 415.

³²¹ Article 51, *ibid.*

³²² Article 52, *ibid.* at 416.

³²³ Article 53, *ibid.* at 417.

³²⁴ Article 54, *ibid.*

³²⁵ Article 55, *ibid.* at 418.

³²⁶ Article 56, *ibid.*

³²⁷ Article 57, *ibid.* at 419.

precautions to be taken against the effects of attack.³²⁸ As may now be obvious, all of these provisions affect the conduct of space warfare insofar as each limits potential targets and restricts options otherwise available to military space forces.

Perhaps the biggest concern raised by these provisions was the attempt to return warfare to restricted means and methods “not ... seen in this century.”³²⁹ Specifically, the cumulative effect of these provisions worked to “shift the responsibility for the protection of the civilian population away from the host nation (which has custody over its civilian population, and which traditionally has borne the principal responsibility for the safety of the civilian population) almost exclusively onto the attacker.”³³⁰ Two problems with this attempt at burden-shifting arise. The first concerns the threat to state sovereignty in cases amounting to self-defense. As the statement of France indicated in the ICRC commentary to article 48, had there been a separate vote on article 48, “France would have abstained inasmuch as it considered the article to have ‘direct implications as regards a State’s organization and conduct of defense against an invader.’”³³¹

A second concern raised by the formulations of Protocol I is its apparent failure to acknowledge that attacks are often taken as a reply to previous aggression.³³² In this regard, the allies carrying out strategic air operations over Nazi Germany, or the multinational force that marched into North Korea in 1950, would have been rendered

³²⁸ Article 58, *ibid.* at 420.

³²⁹ Parks, *supra* note 201 at 112.

³³⁰ *Ibid.* Just as significant an issue as is the burden shifting, is the legal affect of violations by the defender vis-à-vis the attacker. A common view of Protocol I, Article 58, which requires that “the parties” (including both attacker and defender) shall take precautions against the effects of attacks “to the maximum extent feasible” (Roberts & Guelff, *supra* note 209 at 420), is that violation by the defender in its obligations toward its own civilians does not absolve the attacker of its obligations when considering attacks that put such civilians at risk. This appears to conflict with the position taken by the US Air Force law of war manual to the effect that “[a] party to a conflict which places its own citizens in positions of danger by failing to carry out the separation of military activities from civilian activities necessarily accepts, under international law, the results of otherwise lawful attacks upon the valid military objectives in their territory.” AFP 110-31, *supra* note 224 at para. 5-4b. For an interesting resolution of this apparent conflict, see Schmitt, Book Review of *Law on the Battlefield*, *supra* note 219 at 267. Key to the resolution is the clause “otherwise lawful attacks.” Ultimately, the best view conceives violations by the defender to take precautions as “merely a factor in mitigation should the attacker violate its own.” *Ibid.* It should also be noted that although AFP 110-31 presents a view from the United States Air Force, the document’s preamble specifies that it “does not promulgate official U.S. Government policy.”

³³¹ Parks, *supra* note 201 at n.351. Parks notes further that the French position was not isolated, but representative.

³³² *Ibid.*

militarily impotent had the restrictions of Protocol I applied. The 1991 Gulf War provides an additional example.

For these and other reasons as well, the Protocol attempts to restrict means and methods of warfare, including aerial warfare, to an extent not acceptable to a number of nations, without whose support the law of war can not properly function.³³³ Given the denunciations by France and the United States, the Protocol did not serve to limit warfare in either the 1991 Gulf War, or the 1999 NATO air war against Yugoslavia, except to the extent it was viewed as declaratory of customary law. Given the strongly-held conviction of these two major airpower states, it is difficult to see Protocol I serving as a meaningful limitation on aerial warfare, and thus space warfare, for the foreseeable future.

3. Additional Conventions Adopted Since 1972 Affecting the Jus in Bello

Since the close of the diplomatic conference which adopted the Protocols to the Geneva conventions, additional conferences have adopted five principal treaties (in some cases designated protocols to other treaties) affecting the *jus in bello*. These include, in chronological order, treaties on Biological Weapons,³³⁴ Environmental Modification,³³⁵ Conventional Weapons,³³⁶ Chemical Weapons,³³⁷ Blinding Lasers,³³⁸ and Anti-Personnel Mines.³³⁹ Of these, the most likely to effect potential means and methods of space warfare is the Environmental Modification Treaty.

³³³ For additional perspectives, see G.H. Aldrich, "Prospects for United States Ratification of Additional Protocol I to the 1949 Geneva Convention" (1991) 85:1 A.J.I.L. 1; B.M. Carnahan, "Protecting Civilians Under the Draft Geneva Protocol: A Preliminary Inquiry" (1976) 18:4 A.F.L. Rev. 32.

³³⁴ *Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction*, 10 April 1972, 1015 U.N.T.S. 164, 26 U.S.T. 583, 11 I.L.M. 309 (entered into force 26 March 1975).

³³⁵ *Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques*, 18 May 1977, 1108 U.N.T.S. 151, 31 U.S.T. 333, T.I.A.S. 9614 (entered into force 5 October 1978), (1977) 16 I.L.M. 88 [hereinafter *Environmental Modification Treaty*].

³³⁶ *Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects*, 10 October 1980, 1342 U.N.T.S. 7 (entered into force 2 December 1983), (1980) 19 I.L.M. 1523 [hereinafter *Conventional Weapons Treaty*]. The treaty contained protocols on (1) fragments not detectable by X-rays; (2) mines, booby traps, and other devices; and (3) incendiary weapons.

³³⁷ *Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction*, 13 January 1993, (1993) 32 I.L.M. 800.

³³⁸ *Protocol on Blinding Lasers*, *supra* note 250.

³³⁹ *Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction*, 18 September 1997, (1997) 36 I.L.M. 1507 (entered into force 1 March 1999).

This Treaty does not restrict the use of environmental modification techniques for “peaceful purposes,”³⁴⁰ but does proscribe the “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.”³⁴¹ The Treaty is of particular importance to space warfare in that “environmental modification techniques” are defined to 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*.”³⁴²

The Treaty’s provisions make clear that its purpose is not so much environmental protection, as a restriction against States making or attempting changes to environmental processes as an instrument of warfare. The means of warfare prohibited by the Treaty need not adversely affect the environment itself because the prohibitions of Article I apply only to the use of the environment as a weapon.³⁴³ Further, though not incorporated into the convention itself, the Parties attached a series of “Understandings” to the Treaty which, as part of the negotiating record, clarify terms used in the text. The “Understanding Relating to Article II” includes a non-exhaustive list of illustrative phenomena that could be caused by environmental modification techniques. In addition to earthquakes, tsunamis, changes in weather patterns, climate patterns, and ocean currents, these include *changes in the state of the ozone layer and changes in the state of the ionosphere*.³⁴⁴ Although all of these effects could be attempted from space, the latter two seem the most likely possibilities. However, the restrictions established by this Treaty do not seem applicable to any major weapons programs publicly reported to be now in development. So long as space weapons do not change the outer space environment “through the deliberate manipulation of natural processes,” the treaty is not likely to serve as a bar to the deployment or use of space weapons.³⁴⁵

³⁴⁰ *Environmental Modification Treaty*, Article III(1), *supra* note 335, 1108 U.N.T.S. at 153.

³⁴¹ Article I(1), *ibid*.

³⁴² Article II, *ibid*. [emphasis added].

³⁴³ Schmitt, “Green War,” *supra* note 221 at 82.

³⁴⁴ *Report of the Conference of the Committee on Disarmament*, U.N. GAOR, 31st Sess., Supp. No. 27, at 91-92, U.N. Doc. A/31/27 (1976), reprinted in Schindler & Toman, *supra* note 198 at 168.

³⁴⁵ Given its narrow scope, the Treaty “affects only a very narrow band of possible operations.” Schmitt, “Green War,” *supra* note 221 at 85.

In addition to the Environmental Modification Treaty, the four protocols to the Conventional Weapons Treaty limit the combat use of non-detectable fragments; mines, booby-traps, and other devices; incendiary weapons; and anti-optic lasers. The restriction on "mines, booby-traps, and other devices" will not apply to space warfare as its terms apply only to those devices "on land."³⁴⁶ Though of possible significance, the protocol restricting use of incendiary devices seems unlikely to affect the development of means and methods of space warfare unless States Parties develop such weapons to be delivered from space. The protocol limiting use of blinding lasers will possibly become relevant as such devices could be employed in space.³⁴⁷ There is increasing interest in the use of lasers in combat, even those which may cause incidental eye injury.³⁴⁸ However, rather than applying these four rather specific provisions to space warfare, the more likely course will entail development of further protocols to this Convention effecting specific limits on conventional space weaponry.

4. Jus Ad Bellum Under the United Nations Charter

The Charter of the United Nations governs the very legitimacy of States' use of force in the first place. As such, it is not formally part of the law of war but rather forms part of the *jus ad bellum*. Nonetheless, because the Charter governs the lawful use of

³⁴⁶ Article 1, amended 3 May 1996, (1996) 35 I.L.M. 1206.

³⁴⁷ Whether such weapons have been used against military personnel remains an open question. A 4 April 1997 incident has raised questions over the possible Russian use of such a weapon against a Naval aviator. The aviator reported severe eye pain and headaches after seeing a distinct dot of red light emanating from the Russian ship *Kapitan Man* in US waters. Despite Russian denials, and a subsequent search of the ship disclosed no laser, suspicions have continued given the several day delay in executing the search and medical reports showing the aviator's injury consistent with a laser attack. Associated Press, "Navy Officer Blames Russian Laser" *The New York Times* (11 February 1999) 1; B. Gertz, "Clinton Won't Back Navy Officer After Laser Attack" *The Washington Times* (17 May 1999) 1.

³⁴⁸ Interestingly, the *Protocol on Blinding Lasers* implicitly recognizes that lasers are not prohibited as a weapon system so long as they are not "specifically designed" to cause blindness. Article 1, *supra* note 338 at 1218. Article 2 states: "In the employment of laser systems, the High Contracting Parties shall take all feasible precautions to avoid the incidence of permanent blindness to unenhanced vision. Such precautions shall include training of their armed forces and other practical measures." *Ibid*. This restriction presupposes that laser systems might in fact be used ("in the employment ..."), and that they might be used by military forces whose use will necessitate training for proper use so as to avoid functioning as a blinding weapon. The US military is studying the use of an "Anti-Personnel Beam Weapon" that would likely cause slight skin or eye irritation by carrying an electrical charge through a laser stream of ionized air. D. Mulholland, "Laser Device May Provide U.S. Military NonLethal Option" *Defense News* (14 June 1999) 6.

force, its provisions are necessarily related to considerations of how that force is used under the *jus in bello*.³⁴⁹

The Charter is "two-faced," serving both as the constitutional document for the United Nations organization itself, as well as providing substantive principles of international law.³⁵⁰ The substantive provisions are intended to advance the goals articulated in the Preamble of the Charter, including among others, the creation of conditions for the maintenance of international peace and security.³⁵¹ This objective rests on the proscription of the aggressive use of force, which finds expression in two portions of the Charter, paragraph 2(4) and Chapter 7.³⁵² In this respect, the principal contribution of the U.N. Charter to the use of military force, is its authoritative articulation of the *jus ad bellum*.³⁵³

The oft-cited provision of paragraph 2(4) enunciates the well-established international legal principle³⁵⁴ prohibiting the use of force: "All Members shall refrain in

³⁴⁹ But note that the law of war applies whether a use of force is lawful or not. See *supra* note 218 and accompanying text.

³⁵⁰ A third function of the Charter is to provide the constitutive features of the International Court of Justice, established under Article 92 of the Charter, by means of the *Statute of the International Court of Justice* appended to the Charter and consisting of 70 articles. *Statute of the International Court of Justice*, 26 June 1945, Can. T.S. No. 7 at 48 (entered into force 24 October 1945) [hereinafter *Statute of the International Court of Justice*].

³⁵¹ Article 1, paragraph 1, states the first purpose of the United Nations: "To maintain international peace and security, and to that end: to take 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 the peace . . ." The Charter states this principle against the backdrop of its preamble which decries the "untold sorrow" of the world wars of the twentieth century and calls war a "scourge." *Charter of the United Nations*, 26 June 1945, Can. T.S. No. 7 (Entered into force 24 October 1945) [hereinafter *U.N. Charter*].

³⁵² As its title suggests, Chapter 7, containing Articles 39 through 51, applies to "Action with Respect to Threats to the Peace, Breaches of the Peace, and Acts of Aggression."

³⁵³ While a thorough exposition of the *jus ad bellum* is beyond the scope of this thesis, some understanding of the field, and of its principle source, could work to eliminate confusion in legal analysis as, for example, misidentification of an issue as one of *jus in bello* which is actually one of *jus ad bellum*. Such confusion could lead to errant legal conclusions under the law of war.

³⁵⁴ Malanczuk goes even further: "The prevailing view is that the Charter has enacted a comprehensive rule on the prohibition of the use of force, which has become recognized as *ius cogens* . . ." *Introduction to International Law*, *supra* note 208 at 311. The International Law Commission agrees: "the law of the Charter concerning the prohibition of the use of force in itself constitutes a conspicuous example of a rule in international law having the character of *ius cogens*." Quoted in D. Harris, *Cases and Materials on International Law* (London: Street & Maxwell, 1998) at 835 [hereinafter Harris]. This is the view of the United States as well, as quoted from its pleadings by the International Court of Justice in the *Nicaragua* case, *supra* note 219. Taken from Article 53 of the 1969 *Vienna Convention on the Law of Treaties*, the concept of *jus cogens* constitutes "peremptory norm[s] of general international law," which become the most basic ordering concepts in international law. They are principles from which no treaty may derogate. *Vienna Convention on the Law of Treaties*, 23 May 1969, 1155 U.N.T.S. 331, 8 I.L.M. 679, 63 A.J.I.L. 875 (entered into force 27 January 1980) [hereinafter *Vienna Convention*]. In this way, *jus cogens* is the

their international relations from the threat or use of force against the territorial integrity or political independence of any state, or in any other manner inconsistent with the Purposes of the United Nations.”³⁵⁵ Balancing this general proscription, is the exception for “self-defense” found in Article 51: “Nothing in the present Charter shall impair the inherent right of individual or collective self-defense if an armed attack occurs against a Member of the United Nations, until the Security Council has taken measures necessary to maintain international peace and security. . . .”³⁵⁶ Article 51 goes on to require member states to notify the Security Council of any actions taken pursuant to this right of self-defense.

Of the many legal issues these two provisions raise, two of the most obvious affect the use of force in outer space. First, what is the meaning of “threat or use of force” in relation to outer space as contained in Article 2(4)? And second, what is the meaning of “if an armed attack occurs” in Article 51? These issues have been widely discussed in the scholarly literature and will be only briefly addressed here.

Under Article 2(4), states may neither *use* force in the course of their international relations, nor *threaten* it. Though widely ignored in state practice, the Charter makes no distinction between the illegality of using force and of threatening it. Ordinarily, the use of force follows a threat of it. In such cases, the use of force gets all the legal analysis, and the threat, if noticed at all, does not attract separate consideration as an independent violation.³⁵⁷ In cases where the use of force does not accompany a threat, the threat is not generally considered sufficient reason to take action. Indeed, not only has the mere threat of force seldom led a state to protest the matter under article 2(4), but “state practice reveals a relatively high degree of tolerance towards mere threats of force.”³⁵⁸ Nonetheless, the Charter’s proscription remains. Given the fact that space warfare will

international legal norm that norms all other norms. Examples that are widely acknowledged by scholars include the rules against genocide and slavery.

³⁵⁵ *U.N. Charter*, *supra* note 351 at 6.

³⁵⁶ *Ibid.* at 24.

³⁵⁷ Several reasons may account for this. Chiefly, the negative effects of a threat are thought to pale in comparison to the effects of actual force. And, as Sadurska notes, there may actually be occasions in which the threat of force “far from precipitating fighting, may be an effective mechanism for dissuading international actors from using violence.” R. Sadurska, “Threats of Force” (1988) 82:2 A. J. I. L. 239 at 247. In this way, the threat may actually work as a substitute for the use of force.

³⁵⁸ A. Randelzhofer, “Article 2(4)” in B. Simma, et al., eds., *The Charter of the United Nations: A Commentary* (Oxford UK: Oxford University Press, 1994) 118 [hereinafter Randelzhofer].

require new application of existing legal regimes, if not new regimes altogether, new means and methods of using force will also give rise to new means of making threats, including those from space.

Significantly, the Charter's focus on "force" rather than "war" reflects a contemplated decision to outlaw all manner of armed conflict. "Force" is a broader category than war. Thus the Charter prohibits all cases of armed force whether or not the parties recognize a formal state of war between them. How states make this formal recognition also varies from situation to situation and can be difficult to ascertain. It ultimately depends upon either the issuance of a declaration or ultimatum, or the occurrence of an "act of war." And yet even what might constitute an act of war does not always initiate war. As professor Green puts it, "whether the armed conflict amounts to a war in the international legal sense of the term depends upon the reactions of the victim of the attack and also, to some extent, upon the attitude of non-parties to the conflict."³⁵⁹

Even more difficult historically than defining a state of war, has been the attempt to determine what "force" the Charter prohibits given the many sources of pressure nations may use in their relations with each other. It is now widely agreed that such force does not include political or economic force, as well as most forms of non-military physical force.³⁶⁰ Included in the prohibition however, not only are cases of direct military force but indirect force as well. Thus, the use of irregular forces, mercenaries, or the arming or training of indigenous rebel forces against their own government would constitute cases of indirect aggression prohibited by the Charter.³⁶¹ Regarding the latter however, the International Court of Justice clarified in the *Nicaragua v. United States* judgment that not all forms of aid violate the rule of Article 2(4), noting for example that the supply of funds to a rebel force does not constitute "force."³⁶² The potential implications of this distinction for space support are far reaching as it will allow spacefaring states to argue that the provision of *information* to insurgents, a principal benefit of space assets,³⁶³ is more akin to the provision of money than of arms.

³⁵⁹ Green, *supra* note 230 at 70.

³⁶⁰ Randelzhofer, *supra* note 358 at 112, 113. The author points out that while these forms of coercion may not constitute "force" under article 2(4), their use may violate the general principle of non-intervention.

³⁶¹ *Ibid.* at 113, 114.

³⁶² *Nicaragua*, *supra* note 219 at 119.

³⁶³ See discussion of information warfare, *infra* Chapter 6, section D.

Perhaps the biggest question with respect to the self-defense principle embodied in Article 51 relates to the meaning of the phrase "if an armed attack occurs." This seems to preclude the right to defend with arms, until an actual armed attack has triggered the right. Thus, the phrase appears to rule out "anticipatory" self-defense.³⁶⁴ As with the application of article 2(4), nothing in article 51 restricts the inherent right of self-defense,³⁶⁵ to the use of force within earth's atmosphere. Although the delegates to the diplomatic conference adopting the Charter in 1945 did not likely have in mind the application of force from outer space, we have subsequently learned that its rudimentary possibility was then under review by the United States and Soviet Union. Nonetheless, as with the application of numerous international instruments to new situations and technological realities, there is no reason exclude the terms of article 2(4) and 51 from application in outer space.

One consequence of the right of self-defense is that the law does not absolutely prohibit war; wars defensive in character that are undertaken pursuant to Article 51, are not illegal.³⁶⁶ However, recognizing the abstract rule is relatively simple, applying it to a specific conflict is not. Nonetheless, international law must assess the relative legal positions of competing belligerents in order to sort out what relations exists between the parties to the conflict, and to third party States. For example, although parties to a conflict increasingly ignore the distinction between "war" and other forms of armed

³⁶⁴ Such forms of self-defense occur when a state uses armed force to repel an "imminent" attack before it actually occurs.

³⁶⁵ In its lengthy review of customary international law related to the use of force in *Nicaragua*, the International Court of Justice stated that the right of self-defense referenced in the Charter at Article 51, as an "inherent right," is firmly rooted in customary international law. This explicit provision in the Charter therefore provides parallel authority for the assertion of the right.

³⁶⁶ In addition to wars of a defensive character, the *U.N. Charter* also authorizes armed force pursuant to authority by the Security Council. *Cf.* Article 42: "Should the Security Council consider that measures provided for in Article 41 would be inadequate or have proved inadequate, it may take such action by air, sea or land forces as may be necessary to maintain or restore international peace and security." Presumably, the enumeration of "air, sea or land forces" is meant to suggest that the Security Council may use *any* form of force it deems necessary, these three being the exhaustive means then in existence in 1945. On this interpretation, the list is not exclusive, but indicative of the scope of Security Council authority. Though not specifically mentioned, the use of space forces would be a legitimate exercise of authority as well.

conflict,³⁶⁷ the law does recognize that a formal state of war³⁶⁸ will entail certain consequences that mere armed conflict will not.³⁶⁹

³⁶⁷ In addition to the fact that Article 2(4) applies to conflicts not formally constituting wars, professor Harris points out an additional reason for this – the terms of the 1949 Geneva Conventions and the 1977 Protocols apply to “all cases of declared war or of any other armed conflict.” D.J. Harris, *Cases and Materials on International Law*, 5th ed. (London: Street & Maxwell, 1998) at 860, n.3

³⁶⁸ The laws of war have evolved with state practice regarding initiation of hostilities. De Mulinen points out that historically an armed conflict commenced with a previous warning either in the form of a declaration of war, or an ultimatum containing a conditional state of war. See F. De Mulinen, *Handbook on the Law of war for Armed Forces* (Geneva: International Committee of the Red Cross, 1987) at 30. Subsequently, as such declarations and warnings fell out of use, the laws of war continued to apply to conflicts short of war. Thus, the common article 2 to each of the four Geneva conventions of 1949 applies the provisions of each convention to “all cases of declared war or of any other armed conflict which may arise between two or more of the High Contracting Parties. . . .” The Conventions do not specify what constitutes an “armed conflict,” thus De Mulinen appears correct in asserting that “no minimum of intensity of violence or fighting, no minimum of military organization and no minimum of control of territory is required.” *Ibid.* at 31. Any armed violence between the representatives of one state and those of another will trigger application of the laws of war, whether the conflict amounts to “war” or not.

³⁶⁹ Of the legal effects created by a formal state of war, perhaps the most interesting for purposes of the law of war is the termination of certain categories of treaties between the belligerent states. See J. Delbrück, “War, Effect on Treaties” in *EPIL*, vol. 4, *supra* note 29 at 310. Delbrück notes that the effect of war on treaty obligation is nowhere specifically enumerated. The older consensus was that war terminated all treaty relations and obligations as between the belligerents. The newer approach in international law takes a more flexible approach, preferring to preserve international order and to see war as simply suspending the execution of certain treaties. Thus Justice Cardozo, writing in 1920 anticipated the current trend: “[I]nternational law today does not [in cases of war] preserve treaties or annul them regardless of the effects produced. It deals with such problems pragmatically, preserving or annulling as the necessities of war exact. It establishes standards, but it does not fetter itself with rules.” *Ibid.* (quoting from *Techt v. Hughes*, 229 N.Y. 222 at 241 (1920)). Delbrück continues that “[w]ar may now be illegal, but it has not thereby become a phenomenon outside the realm of law.” *Ibid.* at 311. In this way, the law prefers to give effect to treaties to the maximum extent possible. Those treaties that must be suspended during war include multilateral treaties with which the belligerents are unable to comply due to the impact of the war. Those that will be terminated include “political treaties” that depend for their existence and proper functioning on normal political and social relations between the belligerents – relations that are terminated by war. Significantly, though the *Vienna Convention on the Law of Treaties* provides that the severance of diplomatic relations between the parties to a treaty does not normally affect the legal relations between them as established by the treaty, the Convention does not specify how war effects the operation of treaties. *Vienna Convention*, Article 63, *supra* note 354 at 347.

Chapter Four: Space Warfare Under the *Corpus Juris Spatialis*

Even in the vast expanse of space it can be expected, further, that the host of participants who will in the future seek to enjoy the many different potential uses of this great resource will in countless ways, whether deliberately or inadvertently, interfere with each other.³⁷⁰

M.S. McDougal, H.D. Laswell & I.A. Vlasic
(1963)

With the exception of environmental protection, no major category of international law is of more recent origin than that devoted to outer space.³⁷¹ Given its recent origin, and the fact that it is predominantly driven by technological advances in the exploration and use of space, space law is a discipline in transition – additional norms continue to emerge as space technology advances. ‘Space law’ is defined as that comprising “all international and national legal rules and principles which govern the exploration and use of outer space by States, international organizations, private persons and companies.”³⁷² Significantly, this broad definition reflects the rise of national legislation governing outer space activity, as well as of non-State actors in the increasingly commercialized and privatized space industry.

Despite its relative recency, literally “[t]housands of articles, studies, and books have been published on the subject of space law.”³⁷³ Indeed, several of these appeared

³⁷⁰ McDougal, Laswell & Vlasic, *supra* note 87 at 514.

³⁷¹ Space law is “a newcomer to the family of legal disciplines.” *United States Space Law: National & International Regulation*, Release 98-2, vol. I (Dobbs Ferry, NY: Oceana Publications, 1998) at 17. That space law rightfully takes its place as a major branch of international law is now beyond question. Jennings notes the following seventeen categories: (1) the position of States in international law, (2) the law relating to international peace and security, (3) the law relating to economic development, (4) State responsibility, (5) succession of States and governments, (6) diplomatic and consular law, (7) the law of treaties, (8) unilateral acts, (9) the law relating to international watercourses, (10) the law of the sea, (11) the law of the air, (12) the law of outer space, (13) the law relating to the environment, (14) the law relating to international organizations, (15) international law relating to individuals (including nationality, extradition, right of asylum and human rights), (16) the law relating to armed conflicts, and (17) international criminal law. See R.Y. Jennings, “International Law” in EPIL, vol. 11 *supra* note 29 at 278, 288ff.

³⁷² P. Malanczuk, “Space Law as a Branch of International Law” (1994) 25 N.Y.I.L. (The Hague: Martinus Nijhoff Publishers, 1995) 143 at 147 [hereinafter Malanczuk, “Space Law”].

³⁷³ V. Kopal, “Evolution of the Doctrine of Space Law” in N. Jasentuliyana, ed., *Space Law: Development and Scope* (Westport: Praeger, 1992) 17 [hereinafter Jasentuliyana, *Space Law*].

before 1957, the year human activity within outer space began.³⁷⁴ Thus, while it is a recent phenomenon, space law today is a firmly established discipline resting essentially on five multilateral treaties. As used here, these five treaties comprise the “*corpus juris spatialis*” while “space law” includes prescriptive norms from other treaties as well, including those discussed in Chapter Five. Before analyzing the textual bases of space law it is important to note its several distinctive features. These are important to the application of existing space law to armed conflict in space.

One notable feature in the continuing development of international space law is its use, by analogy, of norms drawn from other branches of international law. Because this feature of space law is explained more fully below, only a brief reference to it will be made here.³⁷⁵ The progressive development of space law has not emerged in a legal vacuum. “[T]here is, in certain respects, a catena of notions which justifies a comparison between the concepts applicable to outer space with those of other environments.”³⁷⁶ Specifically, in establishing an early framework for space activities, “lawmakers were able to borrow from existing principles of international law, including analogies from international maritime law, the Antarctic treaty, and the Partial Test Ban Treaty.”³⁷⁷ From use of these analogies space law is able to draw specific conclusions. For example, one commentator cites the legal propriety of spying from space as having emerged by reference to the law of the sea. “[S]ince outer space is beyond State sovereignty, as are the high seas, and as espionage from (or over) the latter is generally accepted as being a legal activity, it has been concluded that espionage from outer space is also legal.”³⁷⁸ Others have accurately speculated on this basis that military spacecraft will be allowed to enter the territory of other states only upon special authorization, just as is the case with

³⁷⁴ Although the US had placed a man-made object in outer space prior to this, 1957 is considered the watershed year in which the “Space Age” is most often said to have begun. On October 4 of that year, the Soviet Union launched Sputnik I, the world’s first man-made satellite. See Heppenheimer, *supra* note 62 at 122 et seq.

³⁷⁵ See *supra*, Chapter 6, section A.1.

³⁷⁶ Matte, *Space Activities*, *supra* note 54 at 175-176.

³⁷⁷ N. Jasentuliyana, “The Lawmaking Process in the United Nations,” in N. Jasentuliyana, *Space Law*, *supra* note 373 at 41.

³⁷⁸ B.M. Hurwitz, *The Legality of Space Militarization* (Amsterdam: North Holland, 1986) at 29-30 [hereinafter Hurwitz].

military aircraft.³⁷⁹ As it has for over 40 years, the principle of analogy will continue to play an important role in the evolution of space law.

Another important feature of space law derives from the permissive nature of public international law in general.³⁸⁰ A specific example illustrates the point. Because space law prohibits only the stationing of *weapons of mass destruction* in orbit around the earth, States may orbit weapons of lesser destructive capability for the simple reason that no specific prohibition exists.³⁸¹ In addition, States are free to make full use of military reconnaissance satellites given the absence of international prohibitions on such activity.

A third feature of international space law also flows from the general nature of public international law as well. International space law regulates the conduct of *States*. As distinguished from "Astrolaw,"³⁸² space law is limited to "the regulation of those activities by States in outer space which are, by nature, essentially international."³⁸³ This remains true despite the rise of both public and private efforts at commercialization of space. While international agreements will increasingly recognize the presence of private interests in space, the dominant actors, with respect to international legal rights and obligations, will continue to be States.³⁸⁴

³⁷⁹ See McDougal, Lasswell & Vlasic, *supra* note 87 at 729.

³⁸⁰ See *supra* note 219.

³⁸¹ Of course, prohibitions could come from a variety of sources other than "space" treaties. Customary international law could also supply the requisite prohibition on State action. In the case cited however, as will be argued further below, no such prohibitions exists.

³⁸² As J.H. Glazer puts it "Astrolaw contemplates the practice of law *in* outer space. . . . The direct subjects of Space Law are sovereign nations; the direct subjects of Astrolaw are natural and legal persons in space. . . . Astrolaw focuses not upon space as a legal regime, but upon space as a place." Quoted in G.S. Robinson & H.M. White, Jr., *Envoys of Mankind: A Declaration of First Principles for the Governance of Space Societies* (Washington, D.C.: Smithsonian Institution Press, 1986) at 147. Others refer to Astro Law as a necessary supplement to the space law treaty system and as a "common law of outer space." D. O'Donnell & N.C. Goldman, "Astro Law as *Lex Communis Spatialis*" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 322.

³⁸³ C.J. Cheng, "New Sources of International Space Law" in C.J. Cheng, ed. *The Use of Air and Outer Space Cooperation and Competition* (The Hague: Kluwer Law International, 1998) 209. Cheng further notes that although different titles for this body of law such as 'Aerospace Law,' 'International Law of Outer Space,' 'International Space Law,' 'Space Law,' and 'The Law of Outer Space,' "provide notional concepts about the scope of international space law . . . [i]n its inception, this new branch of law was defined as a corpus of rules which govern the space activity of *States*." *Ibid.* at 208, n.1, 209. [emphasis added].

³⁸⁴ Though this is true generally as a basic tenet of international law, it is especially true of space law which makes States internationally responsible for all national activity, whether public or private. See *infra* note 411 and accompanying text.

A. Customary Law

To the extent customary law exists for space law at all, it binds all States whether their consent be express or implied by silence in the face of emerging norms.³⁸⁵ Yet what little customary law for space there is has been derived from the activity of very few States.³⁸⁶ Because of this, and because of the increasing role of treaties both in international law in general and space law in particular, "[c]ustomary law is of far lesser importance and its significance for outer space activities has, in many respects, not been secured."³⁸⁷ This is perhaps yet another function of the youth of space law relative to more established branches of international law – there simply has not been sufficient time and widespread uniformity for customary law to crystallize.

This consideration of customary space law raises two issues regarding the necessary preconditions for its creation. These merit some discussion here because the formation of limits to means and methods of space warfare will likely emerge via customary international law.³⁸⁸ First, the time needed for a custom to evolve into law may be very short, leading some to minimize the importance of widespread State practice. Although space research and development had gone on for over a decade, it was not until the launch of Sputnik I in 1957 that international agreement emerged on basic principles that should govern outer space activity. With respect to the principle of freedom of use

³⁸⁵ In classical international legal theory, customary international law serves as a formal "source" of law. Thus, Article 38 of the *Statute of the International Court of Justice* charges the Court with resolving disputes in accord with international law by applying, *inter alia*, "international custom, as evidence of a general practice accepted as law." *Supra* note 350 at 60-62.

³⁸⁶ The two factors generally regarded as necessary for the crystallization of an emerging norm into customary law are the practice of states and general opinion that the norm under consideration bears the force of law. Thus Malanczuk: "When inferring rules of customary law from the conduct of states, it is necessary to examine not only what states do, but also why they do it. ... State practice alone does not suffice; it must be shown that it is accompanied by the conviction that it reflects a legal obligation. ... The technical name given to this psychological element is *opinio iuris sive necessitatis* (*opinio iuris* for short). It is usually defined as a conviction felt by states that a certain form of conduct is required by international law." Malanczuk, *Introduction to International Law*, *supra* note 208 at 44. The author continues by pointing out the difficulty of ascertaining a state's *opinio iuris* and the modern tendency to "infer *opinio iuris* indirectly from the actual behavior of states." *Ibid*.

³⁸⁷ Malanczuk, "Space Law," *supra* note 372 at 159. But see I.H.Ph. Diederiks-Verschoor, *An Introduction to Space Law* (Deventer, The Netherlands: Kluwer Law and Taxation Publishers, 1993) at 12 [hereinafter Diederiks-Verschoor]: "customary law is already playing a significant role in space law, and ... States have evidently found it necessary, if not expedient, to abide by its rules."

³⁸⁸ As suggested in Chapter Three, the development of a *jus in bello* for space will likely track the method by which the *jus in bello* for aerial combat evolved. In the latter case, after 70-plus years of aerial combat, international law has yet to witness a treaty dedicated to means and methods of aerial warfare. The incremental, customary development of an aerial *jus in bello* will likely be the pattern for space warfare.

and exploration of space, that agreement came almost immediately following the launch of Sputnik I. Because the agreement was largely based on the practice of only two States,³⁸⁹ Professor Cheng went so far as to suggest the emergence of “instant” customary law.³⁹⁰

However, while it is no longer true that a rule of customary law may be established only after decades of uniform practice by States, at a minimum customary law requires the existence of a *custom* if only to retain a semantic integrity for the term “customary law.” More substantively, international law still requires that customary law involve the passage of *some* time. Thus, writing after the appearance of Professor Cheng’s 1965 article, the International Court of Justice enunciated in a 1969 case that, though the time element may be short, it is nonetheless “indispensable” to the formation of customary law.³⁹¹ Later still, in the 1986 *Nicaragua* (Merits) case, the Court implicitly rejected the notion of instant customary law by employing the following reasoning:

³⁸⁹ Although a minority view, some scholars denied the existence of *any* customary law for outer space in the early days of space flight. Thus, as late as 1961 Professor Cooper wrote “it is quite impossible to apply international legal principles in a satisfactory manner in any geographic area whose legal status is unknown. Today the legal status of outer space is as vague and uncertain as was the legal status of the high seas in the centuries before Grotius, in the *Mare Liberum*, focused attention on the need of the world to accept the doctrine of the freedom of the seas. ... no general customary international law exists covering the legal status of outer space.” J.C. Cooper, “The Rule of Law in Outer Space” (1961) 47 Am. Bar Ass’n J. 23 (quoted in Matte, *Space Activities*, *supra* note 54 at 83).

³⁹⁰ B. Cheng, “United Nations Resolutions on Outer Space: ‘Instant’ International Customary Law?” (1965) 5 Indian J. Int’l L. 23 [hereinafter Cheng, “United Nations Resolutions”]. In his fascinating article, Professor Cheng challenged the “orthodox” view of customary law. Placing greater stress on the requirement that States express acceptance of a general practice (*opinio juris*), Cheng continued that “it may be permissible to go further and say that the role of usage in the establishment of rules of international customary law is purely evidentiary: it provides evidence on the one hand of the contents of the rule in question and on the other hand of the *opinio juris* of the States concerned. Not only is it unnecessary that the usage should be prolonged, but there need also be no usage at all in the sense of repeated practice, provided that the *opinio juris* of the States concerned can be clearly established. Consequently, international customary law has in reality only one constitutive element, the *opinio juris*. Where there is *opinio juris*, there is a rule of international customary law.” *Ibid.* at 36. Though this attenuated view of customary law is widely disputed, Cheng’s watershed 1965 article largely framed the debate. Indeed, no less than distinguished scholar R. Bernhardt regards the notion of instant custom a distinct possibility under exceptional cases (though not under “traditional concepts”) in which such instant law is useful or necessary “at least if a new rule is accepted without exception and the conduct of States conforms to it and no measures contrary to the rule are taken.” Cited in Malanczuk, “Space Law,” *supra* note 372 at 160-161. See R. Bernhardt, “Customary Law” in *EPIL*, vol. 7, *supra* note 29 at 61, 64-65. Perceptively, Malanczuk notes that the exceptional cases about which Bernhardt allows under the rubric “customary law” are nothing of the sort. “There may indeed be a need for this, but then it is not custom but some other (new) source of international law.” Malanczuk, *Introduction to International Law*, *supra* note 208 at 46.

³⁹¹ *North Sea Continental Shelf Cases* (Germany v. Denmark; Germany v. The Netherlands), [1969] I.C.J. Rep. 4 at 43 [hereinafter *North Sea Continental Shelf Cases*]. Specifically, the Court stated that “an indispensable requirement would be that within the period in question, short though it might be, State

The mere fact States declare their recognition of certain rules is not sufficient for the court to consider these as being part of customary international law. ... Bound as it is by Article 38 of the Statute ... the Court must satisfy itself that the existence of the rule in the *opinio iuris* of States is confirmed by practice.³⁹²

By extension, this means there can be no customary law without confirmation of the rule in State practice. As the Court observed, such confirmation cannot come simply by means of declaration, devoid of State practice in space and *time*. The fact the customary law cannot crystallize without the passage of time underscores the preeminent place that treaties will play, at least for the foreseeable future, in the articulation of space law.

A second issue related to customary space law pertains to the status of States "specially affected" by an emerging norm under consideration. International law requires that for the norm to crystallize into customary law, its status as law must enjoy at minimum the acquiescence, if not the outright consent, of States specially affected by the norm in question. Again, the International Court of Justice addressed this requirement in its *North Sea Continental Shelf* judgments,

With respect to the other elements usually regarded as necessary before a conventional rule can be considered to have become a general rule of international law, it might be that, even without the passage of any considerable period of time, a very widespread and representative participation in the convention might suffice of itself, *provided it included that of States whose interests were specially affected*.³⁹³

(emphasis added).

Although not adopted universally as a condition *sine qua non* for the crystallization of customary norms, the idea was emerging even before the 1969 *North Sea Continental Shelf* judgments that specially affected states must act consistent with an emerging custom for it to become law. Thus Lauterpacht writes:

assuming here that we are confronted with the creation of new international law by custom, what matters is not so much the number

practice, including that of States whose interests are specially affected, should have been both extensive and virtually uniform in the sense of the provision invoked." This cautionary approach requires that to the extent the time element is shortened, State agreement on the emerging norm must increase. Yet nowhere does the Court allow that the requirement for the passage of time may be dispensed with, even in cases of perfect unanimity.

³⁹² *Nicaragua*, *supra* note 219 at 97 et seq.

³⁹³ *North Sea Continental Shelf Cases*, *supra* note 391 at 42.

of states participating in its creation and the length of the period within which that change takes place, as the relative importance, in any particular sphere, of states inaugurating the change.³⁹⁴

Today, although a mere "paper protest" would not appear to obstruct the formation of customary law, an interested state's continuous and resolute actual practice to the contrary would. In this way, a "persistent objector," if "specially affected" by the norm under development, could frustrate the crystallization of such norm.³⁹⁵ And, difficult as it may be to ascertain state practice for such analyses, the *North Sea* cases showed that this process of discovery requires examination of factual circumstances in great detail.

The number of states actively engaged in space activities is steadily growing. However, for now the total number likely to be deemed "specially affected" remains small, perhaps six to ten.³⁹⁶ This interest makes these spacefaring States important bellwethers for the development of customary law related to space warfare. To the extent

³⁹⁴ The author went on the point out by way of example the special importance of maritime powers such as the US and UK for matters pertaining to the seas. H. Lauterpacht, "Sovereignty Over Submarine Areas" (1950) 27 B.Y.I.L 376, 394, quoted in D.J. Harris, ed., *Cases and Materials on International Law*, 5th ed. (London: Sweet & Maxwell, 1998) at 40-41. To this can be added the view of Virally, writing on the eve of the *North Sea* decisions: "[f]irm opposition of a number of states, especially if they constitute an appreciable section of the international community or comprehend one or more of the great powers, may no doubt obstruct the formation of a general customary rule." M. Virally, "The Sources of International Law" in M. Sørensen, ed., *Manual of Public International Law* (New York: St. Martin's Press, 1968) at 137. [emphasis added].

³⁹⁵ J.I. Charney, "The Persistent Objector Rule and The Development of Customary International Law" (1985) 56 B.Y.I.L. (Oxford UK: Clarendon Press, 1986) 1 [hereinafter Charney]. In those cases involving persistent objectors not "specially affected," international law allows that although the customary norm under development may fully ripen into customary international law, the objecting state is not bound. Thus held the International Court of Justice in both the *Anglo-Norwegian Fisheries* case ("[i]n any event the ten-mile rule would appear to be inapplicable as against Norway inasmuch as she has always opposed any attempt to apply it to the Norwegian coast." *Fisheries Case (United Kingdom v. Norway)* [1951] I.C.J. Rep. 116 at 131) and the *Asylum* case ("even if it could be supposed that such a custom existed between certain Latin-American States only, it could not be invoked against Peru which, far from having by its attitude adhered to it, has, on the contrary, repudiated it. ..." *Asylum Case (Columbia v. Peru)* [1950] I.C.J. Rep. 266 at 277-278). "In both [cases], the Court had previously found that the substantive rule of law did not exist in the first place. The Court then went on to allow that even if the rule were international law, the objecting States in these cases would not legally be obligated to abide by the rule." Charney, *ibid.* at 9. Accord American Law Institute, *Restatement of the Law Third: The Foreign Relations Law of the United States*, vol. 1, Section 102, Comment (d) (St. Paul, MN: American Law Institute Publishers, 1987) at 26: "[I]n principle a dissenting state which indicates its dissent from a practice while the law is still in the process of development is not bound by that rule of law even after it matures. ..." This is not to say that a State must express its affirmative consent in order to be bound by customary law, just that its objection can work to remove its obligation to comply with the subsequent customary norm that crystallized over its objection.

³⁹⁶ Among this number would certainly include the United States, Russia, the United Kingdom, France, China, India, and Japan.

these States persistently object to a would-be space norm, it cannot become customary law.³⁹⁷

Though custom does not appear to be of great importance presently, the consensus has developed that a few principles of customary international law apply to space activities. These include the "essential principles of the Outer Space Treaty which have been accepted by all States active in outer space by practice and with *opinio juris* after ratification, and where no evidence of dissenting practice on the part of non-ratifying States is available."³⁹⁸ Specifically, these principles include the freedom of exploration and use of outer space by all States, and the prohibition on national appropriation of outer space.³⁹⁹

Because these customary principles are codified in the Outer Space Treaty,⁴⁰⁰ and the treaty has been ratified by all States currently active in space, customary international law seems less important in ascertaining principles applicable to future space warfare. Customary law pertaining to outer space activities is for the most part a subset of treaty law.⁴⁰¹ However, the body of customary law pertaining to space will assume much

³⁹⁷ This examination of interested state practice appears to be the method employed consistently by the International Court of Justice in its examination of customary law, and comports with the opinion expressed by numerous scholars today. Thus, in the *Nicaragua* (merits) case, the Court undertook to establish the customary legal basis for the principle of nonintervention as it analyzed the dispute between the United States and Nicaragua. In so doing, the Court pointed out that although the United States expressed its opinion that U.N. General Assembly Resolution 2131 was not a formulation of law but only a statement of political intention, it later accepted resolution 2625 which purported to declare law on the same point as resolution 2131. *Nicaragua, supra* note 219 at 107. The Court's exercise in resolving the apparent U.S. reservation to the principle of nonintervention is instructive, and makes the most sense when viewed as an attempt to show that the U.S. was not a persistent objector to the principle. In this light, the Court has employed a method logically flowing from its prior assertion as to the required acceptance of "specially affected" states in the formation of customary international law. Given this disposition of the court, and apparently of international law in general, the emerging practice of the United States with respect to the recognition (or nonrecognition) of restrictions on space warfare, becomes most important.

³⁹⁸ Malanczuk, "Space Law," *supra* note 372 at 159.

³⁹⁹ See *ibid.*

⁴⁰⁰ Discussed *infra* at section B.1.

⁴⁰¹ This is subject to the observation that debate now exists as to the status of *potential* customary norms not otherwise addressed by treaty law. These include the notion that international law recognizes a right of space objects, headed either to or from outer space, to freely transit the sovereign airspace of other states. Although some have pointed to the lack of objection by certain states in the case of occasional violations of its airspace by space objects as evidence that the "norm" has crystallized, this view is highly suspect. At a minimum these anecdotal occasions assume that the violated state was aware of the intrusion – unlikely in most cases usually cited. Thus Malanczuk observes that "the contention can hardly be sustained that the practice of space powers to launch their space objects into outer space after 1957 by crossing the air space under the sovereignty of other countries developed into custom by the acquiescence of those states. The countries affected simply often lacked the technological capacities to find out." Malanczuk, *Introduction to*

greater importance as non-parties to the relevant space treaties become active in space activities. For example, should Columbia, Iran, Indonesia, or Yugoslavia acquire the means of space launch in the coming years, all four being non-parties to the Outer Space Treaty, any restrictions on such States' space activity that do not come from obligations imposed by other space treaties⁴⁰² will occur largely by operation of customary international law. Should any of these States later ratify the Treaty, the binding effect of that customary law reflected in the Treaty would become far less important.

B. Treaty Law

In terms of certainty and specificity, treaties form the core of modern international law. This is especially true of space law in general and the *corpus juris spatialis* in particular, neither of which, as discussed above, has existed long enough to provide consensus on any but the most basic principles of customary law. Though in some cases

International Law, *supra* note 208 at 43. Beyond this, even if a state knew about the violation, isolated instances of an intrusion followed by a mere failure to protest is hardly sufficient to establish a customary norm binding the entire international community. More than this would be necessary to evince the requisite *opinio juris*. Thus Wassenbergh: "There is no a right [sic] of (instant?) *customary* international law that space objects can 'freely' transit through foreign airspace. The fact that in practice so far no objections have been raised against transit through a State's airspace by a foreign space object, is not an argument to refer to a customary right of transit, as too few States have considered to be confronted with such transit (and none have been), and no *opinio juris* with respect to such practice has been pronounced as yet." H.A. Wassenbergh, *Principles of Outer Space Law in Hindsight* (Dordrecht: Kluwer Academic Publishers, 1991) at 36 [hereinafter Wassenbergh]. By contrast, the widespread recognition of the principle of freedom of space, though it came rather quickly following the Soviet launch of Sputnik I, was accompanied not only by the lack of objection in the face of orbital overflights, but affirmative acquiescence by most states in the form of United Nations resolutions. An additional customary norm pertains to the right of space surveillance. In this instance a much stronger case can be made that international law contains a customary norm to freely observe other states. As Professor Diederiks-Verschoor notes "[i]t is important to bear in mind that there is as yet no statutory obligation on States, in U.N. Resolutions or elsewhere, to ask for prior consent ..." Diederiks-Verschoor, *supra* note 387 at 11. Given this, and given the general international legal principle that in the absence of prohibition states are free to act as they please, *supra* note 219, it is perhaps better to see the right of space surveillance not so much as requiring specific authorization by an explicit customary norm but as the natural prerogative of a State flowing from its sovereignty and from principle that space is free.

⁴⁰² For example, as of 1993, Columbia and Indonesia had not ratified any of the multilateral space treaties; Iran had ratified the Astronaut Agreement, and Liability Convention; and Yugoslavia had ratified the Astronaut Agreement, Liability Convention, and Registration Convention. Resolution of the difficult question of the Federal Republic of Yugoslavia's uncertain status within international law and its succession to treaties ratified by the Socialist Federal Republic of Yugoslavia is to some extent ongoing as of this writing (July 1999). For discussion of the international legal implication of the dissolution of the former Yugoslavia, see D.J. Harris, *Cases and Materials on International Law*, 5th ed. (London: Sweet & Maxwell, 1998) at 120-131.

restatements of customary international law,⁴⁰³ outer space treaties have largely created new law. Of the treaties discussed below, agreement came as a direct result of the United Nations Committee on the Peaceful Uses of Outer Space (hereinafter COPUOS).⁴⁰⁴ Comprising the *corpus juris spatialis*, these treaties deal specifically and directly with the legal regime governing outer space.

1. 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) – 1967

It is difficult to overstate the preeminent place in space law enjoyed by the first international treaty governing outer space, commonly known as the Outer Space Treaty.⁴⁰⁵ Drawn principally from three previous United Nations General Assembly (UNGA) Resolutions,⁴⁰⁶ the Outer Space Treaty is termed everything from “an

⁴⁰³ For example, in addition to the two principles cited above (the freedom of space for use and exploration, and the prohibition on national appropriation of space or celestial bodies), a third customary principle provides for the rescue of astronauts in distress.

⁴⁰⁴ Established by resolution of the United Nations General Assembly in 1958, COPUOS has served as a central forum for international negotiations toward the development of space law. Although made up of only 61 members, less than one-third of the United Nations membership, and unable to adopt rules and regulations binding on State parties (unlike the International Civil Aviation Organization for example), COPUOS has nonetheless played a remarkably effective role in the early development of space law. Of the five treaties now in force under the *corpus juris spatialis*, all five originated within COPUOS. With only one exception in 1982, COPUOS acts on the basis of consensus. “In other words, every member of the Committee ... was given a veto.” Cheng, “United Nations Resolutions,” *supra* note 390 at 27. Though this makes the negotiation and drafting process “detailed, laborious, and time-consuming” (Jasentuliyana, *Space Law*, *supra* note 377 at 34), it also increases the commitment to the legal regimes created. This is not to suggest that COPUOS is the only international body concerned with space law. The scope of COPUOS’ mandate in the progressive development of space law excludes consideration of military uses, which the major space powers relegate to “fora dealing with disarmament and arms control issues,” Malanczuk, “Space Law,” *supra* note 372 at 150, most notably, the U.N. Conference on Disarmament. As of 1998, the 61 member States of COPUOS included the following (unchanged from 1995): Albania, Argentina, Australia, Austria, Belgium, Benin, Brazil, Bulgaria, Burkina Faso, Cameroon, Canada, Chad, Chile, China, Colombia, Cuba, Czech Republic, Ecuador, Egypt, France, Germany, Greece, Hungary, India, Indonesia, the Islamic Republic of Iran, Iraq, Italy, Japan, Kazakhstan, Kenya, Lebanon, Mexico, Mongolia, Morocco, Netherlands, Nicaragua, Niger, Nigeria, Pakistan, Philippines, Poland, Portugal, Republic of Korea, Romania, Russian Federation, Senegal, Sierra Leone, South Africa, Spain, Sudan, Sweden, Syrian Arab Republic, Turkey, Ukraine, the United Kingdom, the United States, Uruguay, Venezuela, Viet Nam, and Yugoslavia. COPUOS, *Membership of the Committee on the Peaceful Uses of Outer Space*, U.N. Doc. A/AC.105/602 (1995) 1.

⁴⁰⁵ *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, 27 January 1967, 610 U.N.T.S. 205, 18 U.S.T. 2410 (entered into force 10 October 1967) [hereinafter *Outer Space Treaty* or OST].

⁴⁰⁶ Namely, Resolution 1772, 3 January 1962, *International Co-operation in the Peaceful Uses of Outer Space*; Resolution 1962 (XVIII), 13 December 1963, *Declaration of Legal Principles Governing Activities*

ideological charter for the space age”⁴⁰⁷ to the “*Magna Carta* of outer space law.”⁴⁰⁸ Of the five multilateral treaties dealing specifically with outer space activities, it is the most important “by far.”⁴⁰⁹ As a result, it is the legal source of first resort for the analysis of any space law topic.

Other than establishing what can only be called the “constitution” of outer space,⁴¹⁰ the Outer Space Treaty employed a few innovations in international law. One significant innovation pertains to the provision of Article VI requiring that States bear “international responsibility for national activities in outer space ... whether such activities are carried on by governmental agencies or by non-governmental entities....”⁴¹¹ This departure from the general rule of international law, namely, that States bear responsibility only for State activity, makes the contracting State liable for the offenses (or any other activity) of its citizens or private organizations with respect to space activity.⁴¹² This provision marks the first time that such an extension of State liability had occurred in a legally binding document.⁴¹³ Although this provision appears unlikely to significantly affect the ability of States to wage space warfare given the State-controlled nature of military forces, it could impact the research and development of weapons systems. For example, to the extent that a military space contractor pursues testing of space weaponry in outer space, the host State will bear “international responsibility” for the activity.

of States in the Exploration and Use of Outer Space, and Resolution 1963 (XVIII), 13 December 1963, *International Co-operation in the Peaceful Uses of Outer Space*. See *infra* notes 563 through 572 and accompanying text.

⁴⁰⁷ G.S. Robinson & H.M. White, Jr., *Envoys of Mankind: A Declaration of First Principles for the Governance of Space Societies* (Washington, DC: Smithsonian Institution Press, 1986) at 181.

⁴⁰⁸ N. Jasentuliyana, “The Role of Developing Countries in the Formation of Space Law” (1995) XX:II Ann. Air & Sp. L. 95, 97 [hereinafter Jasentuliyana, “Developing Countries”].

⁴⁰⁹ I.A. Vlasic, “A Survey of the Space Law Treaties and Principles Developed Through the United Nations” in *Proceedings of the Thirty-Eighth Colloquium on The Law of Outer Space* (Reston, VA: AIAA, 1996) 324.

⁴¹⁰ “[I]t represents *de facto* and *de jure* the constitution of outer space.” I.A. Vlasic, “Some Thoughts on Negotiating and Drafting Arms Control and Disarmament Agreements Relating to Outer Space” in M.N. Matte, ed., *Arms Control and Disarmament in Outer Space: Towards a New Order of Survival*, vol. IV (Montreal: Center for Research in Air and Space Law, McGill University, 1991) 203 at 212 [hereinafter Vlasic, “Negotiating and Drafting Agreements Relating to Outer Space”]. Subsequent multilateral space law treaties serve primarily as commentaries and clarifications of the *Outer Space Treaty*.

⁴¹¹ *Outer Space Treaty*, Article VI, *supra* note 405, 610 U.N.T.S. at 209.

⁴¹² As State responsibility for national space activity has been a cornerstone of the *corpus juris spatialis* since 1967, it may well be a principle of customary international law binding non-contracting States as well.

Further, the novel principle of State responsibility for “national activities in outer space” could render the home State liable for the unauthorized hostile space activities of its citizens, even if carried out from a foreign country. Despite the great difficulty in regulating such activity, this could mean that the US, for example, would bear responsibility to the Chinese, should a US citizen manage to destroy a Chinese satellite in space, even if construction, launch, and control of the attacking object or method of destruction occurred entirely outside the US, and without its authorization.

An additional provision could be applied to space combat in a variety of respects. Article IX of the OST provides in part:

... States Parties to the Treaty shall be guided by the principle of co-operation and mutual assistance and shall conduct all their activities in outer space, including the moon and other celestial bodies, with *due regard to the corresponding interests of all other States Parties* to the Treaty. States Parties to the Treaty shall pursue studies of outer space, including the moon and other celestial bodies, and conduct exploration of them so as to *avoid their harmful contamination and also adverse changes in the environment of the Earth* resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose. If a State party to the Treaty 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, including the moon and other celestial bodies, it shall undertake appropriate international consultations before proceeding with any such activity or experiment. ...⁴¹⁴ [emphasis added]

At the outset, one observes that Article IX, like most space law provisions, makes no distinction between military and civilian activities. Thus, ordinarily the requirements of Article IX apply fully to military operations in space.⁴¹⁵

One possible limitation for space warfare is suggested by the language prohibiting “harmful contamination” of outer space, the moon, and celestial bodies. Significantly, the provision applies only to “studies of outer space, including the moon and other

⁴¹³ The idea appeared previously in Principle 5 of U.N.G.A. Resolution 1962 (XVIII). However, as argued below, this Resolution did not legally bind any State.

⁴¹⁴ *Outer Space Treaty*, Article IX, *supra* note 405, 610 U.N.T.S. at 209-210.

⁴¹⁵ The entire body of international space law as it applies to space warfare is subject to the limitations effected by a state of “war” between belligerents. The difficult question of how an armed conflict

celestial bodies” and to the “exploration of them.” Thus, while “studies” and “exploration” would likely apply to the testing and development of space weaponry, the restriction does not seem logically applicable to the actual conduct of warfare. Unless by some tenuous definition “warfare” could be brought within the modifying terms “studies” and “exploration,” it appears that State activities in support of warfare, whether within space or in support of Earth-based hostilities, are not prohibited from causing “harmful contamination” under Article IX.⁴¹⁶ It also bears noting that activities triggering the prohibition on harmful contamination, namely “studies” and “exploration,” would also have to avoid “adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter.”

A potentially more significant point from Article IX relates to a State’s duty to engage in “international consultations” prior to engaging in activities which the State “has reason to believe ... would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space, ...” It is not difficult to conceive scenarios in which the use of armed force in space would potentially cause “harmful interference” with other States Parties in their peaceful exploration and use of space. Assuming the hostile act were lawfully directed at an asset in conformity with the *jus ad bellum*, this requirement would not require consultation with the opposing belligerent State as it would not be engaged in the “peaceful exploration and use of outer space.” However, it would require consultations with any third party (neutral) State owning space assets that might foreseeably be interfered with “harmfully.” To the extent that a hostile act in space, whether lawful or not, could harmfully interfere with a third party State’s asset, Article IX appears to require that the State must be consulted.

terminates or modifies obligations otherwise binding on belligerents in peacetime cannot be avoided with respect to space warfare. For an example, see *supra* note 369 and accompanying text.

⁴¹⁶ Though Article IX also requires States to “conduct all their activities in outer space ... with due regard to the corresponding interests of all other States Parties to the Treaty,” this vague exhortation could just as likely apply to the activities of States on earth as well. Certainly as a general proposition the intentional creation of “harmful contamination” would run counter to various principles of international law. However, as is often the case with armed conflict, the law recognizes that as a matter of brute reality, certain activities illegitimate in peace will be tolerated in war. Thus, in analyzing space warfare, the *corpus juris spatialis* cannot be read in isolation from the law of war. In the context of armed conflict, Article IX seems to create no greater duty for States with respect to the space environment than that which exists for the terrestrial environment. But see Vlasic, “Space Law and Military Applications,” *supra* note 52 at 397, “[a]lthough these provisions apparently are not aimed at hostile uses of outer space, they could nonetheless be invoked against military activities not otherwise banned by the Treaty.”

Further, unlike other space treaties and U.N. resolutions that leave the timing of such consultations unclear, Article IX specifies that it must occur "before proceeding with any such activity or experiment." This could create a disincentive to carrying out an act of armed conflict as prior consultations with a third party State could, by public dissemination or otherwise, constitute a de facto notification to the opposing belligerent State of the anticipated attack. Nonetheless, the Article IX does not stand in the way of carrying through with such hostile acts once "consultations" have occurred, even if the third party State objects to the anticipated activity or experiment. As a practical matter, though the Treaty requires it, one wonders whether the international community even takes this consultation provision seriously given that so far as is publicly known, no such consultation has ever been undertaken since the adoption of the OST in 1967.⁴¹⁷

With respect to military forces in space, the most significant provision from the OST appears in Article IV, which directly addresses the militarization of outer space:

States Parties to the Treaty undertake not to place in orbit around the earth any objects carrying nuclear weapons or any other kinds 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 maneuvers 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.⁴¹⁸

Among the myriad issues raised by this section, a perennial debate has centered on the meaning of "peaceful purposes," the ambiguous term operating as one of several limitations on State uses of outer space. Because of the centrality of the phrase to questions of military uses of space, a historical sense its use in international parlance is necessary. When first used by the US in 1957, the "peaceful and scientific purposes" of outer space activities soon became the official goal of the United Nations. By vote of 56

⁴¹⁷ B. Reijnen, *The United Nations Space Treaties Analysed* (Gif-sur-Yvette Cedex, France: Edition Frontiers, 1992) at 130-131 [hereinafter Reijnen].

⁴¹⁸ *Outer Space Treaty*, Article IV, *supra* note 405 at 208.

to 9 (15 abstentions), the U.N. adopted Resolution 1148 (XII) on 14 November 1957, which advocated an inspection system to ensure the peaceful uses of space. "This was a landmark document not only because it represented the first General Assembly resolution on outer space but also because it introduced the phrase 'exclusively for peaceful purposes' in an authoritative U.N. text."⁴¹⁹

Of course, simply using the term without definition does not fix its meaning. Professor Vlasic reports that although the first wide-ranging debate on the peaceful uses of outer space at the 13th session of the UNGA in 1958 saw virtually all participants using the term "peaceful" as an antonym for "military," the resolutions this session produced did not attempt "to interpret or clarify the term 'peaceful' so commonly used in the context of contemporary space activities."⁴²⁰ Significantly, although US President Eisenhower proposed by letter to Soviet Premier Bulganin in 1958 that the US and USSR use outer space "only for peaceful purposes" and not for "testing of missiles designed for military purposes,"⁴²¹ the proposal was never consummated by agreement.

As discussed above, while the world community was debating the meaning of terms such as "peaceful purposes," the US and USSR were secretly developing satellite systems with clear military capabilities. Thus in the period from late 1958 to 1959, the US adopted the view that "'peaceful' in relation to outer space activities was interpreted ... to mean 'non-aggressive' rather than non-military. ... By contrast, the Soviet Union publicly took the view, despite its own military uses of space, that 'peaceful' meant 'non-military' and that in consequence all military activities in outer space were 'non-peaceful' and possibly illegal."⁴²² This background forms the context for use of the phrase in the OST. Though the Soviet Union and a number of other States consistently maintained the view that "peaceful" means "non-military," the majority of the international community has failed to agree. Consequently, the view "which today has gained general acceptance, is that non-aggressive military uses are peaceful. Thus, 'peaceful' has come to mean

⁴¹⁹ I.A. Vlasic, "The Legal Aspects of Peaceful and Non-Peaceful Uses of Outer Space" in B. Jasani, ed., *Peaceful and Non-Peaceful Uses of Space: Problems of Definition for the Prevention of an Arms Race* (New York: Taylor & Francis, 1991) 37 at 39 [hereinafter Vlasic, "Peaceful and Non-Peaceful Uses of Outer Space"].

⁴²⁰ *Ibid.*

⁴²¹ *Ibid.* (quoting text of letter as contained in McDougal, Lasswell & Vlasic, *supra* note 87 at 395).

⁴²² *Ibid.* at 40.

general space activity that is beneficial to and in the interests of all countries.”⁴²³ This is essentially the view maintained by the US, which stresses that all States possess the inherent right to defend against foreign aggression in outer space, as well as within earth’s atmosphere.⁴²⁴ Despite the long debate over the term “peaceful” as used in the OST, its meaning has been well-settled through the practice of States and certainly includes military activities.⁴²⁵

When assessing the meaning of a term in one treaty, it is instructive to examine its meaning as used in other treaties as well. Other than the “peaceful purposes” language contained in the Antarctic Treaty, discussed below,⁴²⁶ the phrase appears more recently in

⁴²³ C.Q. Christol, *The Modern International Law of Outer Space* (New York: Pergamon Press, 1982) at 22 [hereinafter Christol, *Modern International Law of Outer Space*]. In addition to the textual problems associated with equating the terms “peaceful” and “non-military,” (indeed Article IV itself contemplates the *military* use of space for scientific research) the interpretation suffers from a practical difficulty. Just about *any* use of space can support a military purpose. Thus, even if a satellite were developed, tested, launched, and controlled by a “civilian” organ of State government, the information it provided could be useful for military purposes. Weather, navigation, communications, and remote sensing are just a few applications of space capabilities of great use to military forces. To say that the *Outer Space Treaty* forbids this activity seems highly dubious. Yet this is the logical extension of the claim that all uses of space must scrupulously avoid any military uses and thereby remain “peaceful.”

⁴²⁴ See *ibid.* at 29.

⁴²⁵ Indeed it includes the prospect of space weapons as well. “If one chooses to ignore the controversy concerning the ‘true’ meaning of ‘peaceful’ in the *Outer Space Treaty*, it is safe to conclude that the Treaty permits the deployment in outer space of anti-satellite weapons, directed energy weapons, or any other kind of weapon, as long as these weapons are not in conflict with the prohibitions of Article IV [such as weapons of mass destruction in orbit] of the *Outer Space Treaty*, or some other international agreement.” Vlasic, “Space Law and Military Applications,” *supra* note 52 at 397. As a linguistic matter, though the “true” meaning of “peaceful” can just as accurately mean “non-aggressive,” (in part evidenced by the fact that Article IV forbids military bases, installations, fortifications, and maneuvers – a meaningless partial demilitarization if “peaceful” simply means “non-military”) the relevant issue is “what does the term allow and what does it prohibit under the law?” On this, the *corpus juris spatialis* is clear.

⁴²⁶ See *infra* notes 554, 555 and accompanying text. Though none go so far as the Antarctic Treaty in divorcing “military” activities from “peaceful purposes,” other treaties specifically suggest that “peaceful,” as used therein, means non-military. Thus, “[a]n examination of agreements which use the term ‘peaceful’ – namely, the Statute of the International Atomic Energy Agency; the Antarctic Treaty; the Treaty for the Prohibition of Nuclear Weapons in Latin America; the Convention on the Prohibition of the Development, production and Stockpiling of Bacteriological (Biological) and Toxic Weapons and Their Destruction; and the Convention on the Prohibition of Military or Any Other Hostile Use of the Environmental Modification Techniques – shows that in all these treaties the term ‘peaceful’ is used in contradistinction to ‘military.’” Vlasic, “Negotiating and Drafting Agreements Relating to Outer Space,” *supra* note 410 at 215. Assuming *arguendo* that this reading is accepted for each treaty cited, it simply demonstrates that when the drafters of a treaty intend for “peaceful” to mean non-military, they so state. In the absence of doing so, one cannot simply assume it. For example, Article 88 of the *United Nations Convention on the Law of the Sea* specifies that “the high seas shall be reserved for peaceful purposes.” *United Nations Convention on the Law of the Sea*, 10 December 1982, U.N. Doc. A/CONF.62/122, 21 I.L.M. 1261 at 1287 (entered into force 16 November 1994). Given the history of State practice on the high seas, this did not turn the high seas into a demilitarized zone. This provision “most certainly cannot be interpreted to mean that military uses of the high seas are prohibited. Both customary law and the uniform practice of States, before 1982 and after, are

the treaty governing the International Space Station (ISS). Consistent with the OST, Article 1(1) of the ISS Agreement requires that uses of the ISS be reserved for peaceful purposes.⁴²⁷ Interestingly, the ISS Agreement seems to recognize the divergent interpretations of the phrase "peaceful purposes." Article 9, paragraph 3(b) provides that "the Partner providing an element shall determine whether a contemplated use of that element is for peaceful purposes. . . ."⁴²⁸ In so agreeing, the Partners reasonably concede that the likelihood of disagreement over the meaning of the term justifies a provision stipulating who should determine its meaning. In this case, each Partner decides for itself whether its proposed use constitutes a peaceful purpose.

This comes as no surprise. Absent cases referred to the International Court of Justice, international obligations have often been subject to unilateral interpretation. Using the ISS Agreement as a reference, it appears safe to assert that unless an interpretation is so tenuous as to amount to bad faith, the decision regarding a proper interpretation of "peaceful purposes" under the Outer Space Treaty continues to rest with the party proposing the action. Legally speaking, because "peaceful purposes" in the OST is not specifically defined it therefore may not mean the same thing as the identical phrase in the ISS Agreement. Further, the self-interpretation provision of the ISS Agreement applies only to the handful of States Parties to the ISS Agreement, which are but a fraction of those States who are parties to the OST. Nonetheless, the meaning of a phrase in an international instrument becomes most clear in light of action by its States Parties. With the exception of China, the States most active in space are all members of the ISS Agreement. How these States behave under their "peaceful purposes" obligations in the ISS agreement will continue to illuminate the meaning of the phrase elsewhere.

A further point from Article IV regards the location to which the "peaceful purposes" restriction applies. The second paragraph limits use of "celestial bodies" including the moon to peaceful purposes. This raises the question whether the "peaceful purposes" limitation, whatever its meaning, applies away from celestial bodies. Christol

crystal clear on this point." Vlasic, "Negotiating and Drafting Agreements Relating to Outer Space" at 215. Once again, unless the treaty specifies that "peaceful" means non-military, or its negotiating history makes it obvious, it cannot be assumed.

⁴²⁷ See ISS Agreement, *supra* note 29 at 1.

⁴²⁸ *Ibid.* at 7.

points out that though the Treaty uses “outer space,” “moon,” and “celestial bodies” at numerous points and in various combinations throughout the substantive articles, the omission of “outer space” in Article IV, paragraph 2 was “clearly intentional.”⁴²⁹ While the term “outer space” as used in the OST includes the Moon and “celestial bodies,”⁴³⁰ the latter terms do not include within them the meaning conveyed by “outer space.” Christol articulates the negotiating history of the Treaty and points out that though several States within COPUOS objected to the omission of “outer space” from Article IV, paragraph 2, given the clear implication that this would permit non-peaceful purposes for outer space, the view of the US and USSR that the term “peaceful purposes” should apply only to the Moon and celestial bodies won the day.⁴³¹ As such, the restriction does not formally apply to space activities away from celestial bodies.⁴³²

Nonetheless, though Article IV, paragraph 2 does not prohibit the non-peaceful use of outer space away from celestial bodies, such uses are nonetheless implicitly prohibited by other provisions. For example, at least to the extent that “non-peaceful” means the aggressive use of force, such uses are prohibited by the U.N. Charter’s provision to the contrary.⁴³³ Because the OST restricts State activities in space to those “in accordance with international law, including the Charter of the United Nations,”⁴³⁴ an aggressive use of force forbidden on earth is equally forbidden in space. Further, some States such as the US have made the “peaceful” uses of outer space a tenet of national

⁴²⁹ Christol, *Modern International Law of Outer Space*, *supra* note 423 at 20.

⁴³⁰ Christol quotes the principal US negotiator of the treaty, Ambassador Arthur Goldberg, for this proposition: “obviously whatever the definition of outer space, the Moon and other celestial bodies are in outer space.” *Ibid.* at 21.

⁴³¹ *Ibid.* at 24.

⁴³² Professor Vlasic provides one insight as to why the US preferred to restrict the application of “peaceful purposes” to the moon and celestial bodies: “According to former Legal Advisor in the U.S. Department of State, the ‘language of Article IV was carefully chosen to ensure that general principle of ‘peaceful uses’ would not interfere with the testing’ of weapons such as nuclear ballistic missiles.” Vlasic, “Peaceful and Non-Peaceful Uses of Outer Space,” *supra* note 419 at 42. Of course, on the widely-accepted view that “peaceful” means “non-aggressive,” such testing would not have been a problem. Indeed, on this understanding, the actual use of weapons in space can be “peaceful” if compliant with the *jus ad bellum*. Thus, Professor Christol’s pragmatic recognition that “[i]t is a fact that [Article 4(2)] says that the moon and celestial bodies *full stop* shall be used exclusively for peaceful purposes; and by that I take it to mean that this inhibition or restriction does not apply to outer space today. Though I do realize that there are many who make arguments which sometimes are a little overreaching, and whereas my sympathies go with them, my legal training tells me that we had better not read it that way, ...” C. Christol, “Discussion” in M. Cohen & M.E. Gouin, *Lawyers and the Nuclear Debate* (Ottawa: University of Ottawa Press, 1988) 233.

⁴³³ See *supra* notes 355 through 363 and accompanying text.

⁴³⁴ *Outer Space Treaty*, Article III, *supra* note 405, 610 U.N.T.S. at 208.

policy. Thus, the 1958 National Aeronautics and Space Act maintains that "activities in space should be devoted to peaceful purposes for the benefit of all mankind."⁴³⁵ This was reiterated recently in the President's National Space Policy wherein the White House declared "The United States is committed to the exploration and use of outer space by all nations for peaceful purposes and for the benefit of all humanity."⁴³⁶

A further point under Article IV relates to the legal permissibility of satellite interceptors or anti-satellite satellites (ASATs). ASATs deviate from the non-aggressive character of virtually all other satellites, and in so doing may appear to violate the non-aggressive mandate required of all space activities under the "peaceful purposes" restriction. However, regardless of their putative "destabilizing" character for international peace and security,⁴³⁷ the OST does not prohibit the transiting, or even the

⁴³⁵ 42 U.S.C. Sec. 2451(a).

⁴³⁶ The White House, National Science and Technology Council, *National Space Policy* (19 September 1996) [from the Introduction.] The policy statement articulates the long-held US position on the meaning of "peaceful purposes" by stating that "'Peaceful purposes' allow defense and intelligence-related activities in pursuit of national security and other goals."

⁴³⁷ "In the case of weapons systems, there is a much broader feeling [beyond that for military support systems] that they are destabilizing and should be banned." P. Jankowitsch, "Legal Aspects of Military Space Activities" in Jasentuliyana, *Space Law*, *supra* note 373, 143 at 150. Further, in a fascinating recent article, Lieutenant Colonel Bruce DeBlois argues that for reasons of national policy, the US should resist the urge to weaponize space with ASATs. He boldly proclaims the US National Space Policy "weak and ambiguous" with "no clear vision" and no one "in charge," and that for space matters "few people would argue" that the US is "fumbling around in an ad hoc manner." DeBlois, *supra* note 3 at 52-52. Yet even this advocate of the "space sanctuary" school recognizes that "except for [weapons of mass destruction] and [anti-ballistic missile systems for the US and Russia], no international prohibition on space weapons exists." *Ibid.* at 46. It is beyond the scope of this thesis to fully consider the policy merits of weaponizing space. However, the debate that Lieutenant Colonel DeBlois invites is sure to yield a flood of comment, much of which will no doubt take issue with his central premise that space weapons are ultimately destabilizing. With respect to ASATs in the context of the cold war, Stares helpfully summarizes the opposing positions, portions of which still carry some currency in a post-cold war era: "[The pro-ASAT school] starts from the belief that space is just another military arena where satellites will have to adapt to new threats with new countermeasures in the same way that their counterparts on earth have adapted. ... [Proponents believe the US can] deny the Soviets the use of their space assets in wartime while simultaneously preserving the security of U.S. space systems. Moreover, they argue that any attempt to constrain the development of antisatellite systems is illogical and unfeasible; illogical because there are no such limitations on weapons capable of attacking, say, high-flying reconnaissance aircraft or early warning radars, and unfeasible because of the unavoidable presence of the residual antisatellite systems ... The second school ... starts from the belief that the United States is more dependent on the service of military satellites than the Soviet Union is and therefore has more to lose in the event of hostilities in space. The proponents of this view remain highly skeptical of the United State's ability to defend its vital space assets in the face of unconstrained antisatellite development by the Soviet Union. In addition to stimulating an expensive and in the end fruitless competition, they believe an ASAT arms race could seriously erode superpower stability during a severe crisis. Specifically, the knowledge that the other side had a highly effective ASAT weapon system capable of crippling one's own vital early warning and strategic

orbiting, of conventional weaponry in space, including ASATs. The prohibition on orbiting of weapons of mass destruction, including nuclear weapons,⁴³⁸ strongly suggests the distinction between those weapons, and conventional weapons of lesser destructive power, including those directed at satellites. Though Article IV(1) could easily be modified to effect the de-weaponization of space,⁴³⁹ conventional weapons are not proscribed.⁴⁴⁰

A final point from the OST relates to the prohibition on the establishment of "military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers on celestial bodies." Though this clause does not include the "moon" as does the one immediately preceding it, it is clear that the OST uses "celestial bodies" as a phrase which includes the Moon. Thus the first sentence of Article IV(2) speaks of the moon "and *other* celestial bodies." [emphasis added] As a result, Article IV can reasonably be read to prohibit both the creation of permanent military structures on the Moon or other celestial bodies, as well as the testing of weapons there.

communication satellites could become an overwhelming incentive to strike first in a major superpower crisis." Stares, *Space and National Security*, *supra* note 150 at 5.

⁴³⁸ Because the OST does not define "nuclear weapon" its prohibition has stimulated debate over newer technologies such as the X-ray laser which is powered by a nuclear explosion. Whether a nuclear-powered laser is a "nuclear weapon" will mean the difference between its lawful orbiting of Earth or not. P. Jankowitsch, "Legal Aspects of Military Space Activities" in Jasentuliyana, *Space Law*, *supra* note 373 at 147. Given its destructive power, the military significance of such a laser will be tremendous. For example, the intense X-rays emitted as a result of the initial nuclear blast lead some to speculate that one X-ray laser no larger than a packing crate would be able to destroy the entire Russian ICBM arsenal if they were launched at one time in a massive attack. Taylor, *supra* note 176 at 36. In addition to the possibility that such weapons may be "nuclear weapons" under the OST, their immense destructive capability may otherwise render them "weapons of mass destruction."

⁴³⁹ Professor Stojak points out that though it is unlikely to happen, the change could occur without a new treaty were Article IV(1) modified to read: "States Parties to the Treaty undertake not to place *in outer space* [instead of "in orbit around the earth"] any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on *the moon or* on celestial bodies, or stations *weapons* [instead of "such weapons"] in outer space in any other manner." M.L. Stojak, "Recent Developments in Space Law" (Proceedings of the Fifteenth Annual Ottawa NACD Verification Symposium, Montebello, Quebec, 11-14 March 1998) in J.M. Beier & S. Mataija, eds., *Arms Control and the Rule of Law: A Framework for Peace and Security in Outer Space* (Toronto: Centre for International and Security Studies, York University, 1998) 62 [hereinafter Stojak].

⁴⁴⁰ The exception to this applies only to the US and Russia under the Anti-Ballistic Missile Treaty which prohibits "interference" with "national technical means" of arms control verification. See *infra* Chapter 5, Section A.2. With respect to the ban on orbiting of nuclear or other weapons of mass destruction, it has been widely observed that the proscription does not extend to partial orbits. "To be 'in orbit,' an object must circumnavigate the planet at least one full time. When, on 3 November 1967, U.S. Secretary of Defense McNamara announced that the USSR had been testing a Fractional Orbiting Bombing System (FOBS), that could become operational in 1968, he hastened to add that as such an object, while entering

Though non-nuclear weapons testing is not prohibited in outer space,⁴⁴¹ it cannot occur on celestial bodies. Such prohibition could well have been in response to published reports of the US moon base program. In a 21 January 1958 speech about a planned military outpost on the far side of the Moon, Brigadier General Homer A. Boushey explained:

The moon provides a retaliation base of unequaled advantage. If we had a base on the moon, the Soviets must launch an overwhelming nuclear attack toward the moon from Russia two to two-and-one-half days prior to attacking the continental U.S. – and such launchings could not escape detection – or Russia could attack the continental U.S. first, only and inevitably to receive, from the moon – some 48 hours later – sure and massive destruction.⁴⁴²

Whatever its strategic value, such a proposal today would be clearly prohibited by the OST.

2. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue and Return Agreement) – 1968

Adopted in time for the imminent manned moon launchings of the United States, the so-called “Rescue and Return Agreement”⁴⁴³ sought to clarify the duties of states relating to astronauts and objects launched into space.⁴⁴⁴ The Agreement is essentially an expansion of Article V of the OST which required States Parties to regard astronauts as “envoys of mankind” entitled to “all possible assistance.” Divided into provisions dealing with the return of Astronauts (Articles 1-4) and the return of space objects

outer space, does not completely circle the globe, it, like an intercontinental ballistic missile, was not in violation of the 1967 treaty.” Hurwitz, *supra* note 378 at 111.

⁴⁴¹ For the prohibition on nuclear weapons tests in space, see *supra* notes 521 through 523 and accompanying text.

⁴⁴² Quoted in W.E. Burrows, “The Military in Space: Securing the High Ground” in M.J. Collins & S.K. Kraemer, eds., *Space: Discovery and Exploration* (Washington, DC: Hugh Lauter Levin Associates, Inc., 1993) 142.

⁴⁴³ *Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space*, 22 April 1968, 672 U.N.T.S. 119, 19 U.S.T. 7570, T.I.A.S. No. 6599, (entered into force 3 December 1968) [hereinafter *Rescue & Return Agreement*]. Although widely used, the shorthand “astronaut agreement” is unfortunate because it masks the treaty’s application to return of *objects* as well as astronauts. A better shorthand reference would be the “rescue and return agreement” as used for example by Christol, *Modern International Law of Outer Space*, *supra* note 423 at 152 et seq.

⁴⁴⁴ Though never defined, it seems best to think of a “space object” as something distinct from astronauts. However, when international law finally settles on a definition of “space object” it may include astronauts. See *infra* note 450.

(Article 5), the treaty had been ratified by 84 States as of 1997, including the US and USSR (Russia).⁴⁴⁵

Though it appears that space warfare in the foreseeable future will rely primarily on unmanned space activities, the Agreement's provisions on objects as well as those on astronauts will be relevant. Regarding astronauts, the Agreement requires a State Party to make two notifications. It must either notify the launching authority or make a public announcement, *and* notify the U.N. Secretary General⁴⁴⁶ under three conditions: when it receives information or discovers that the personnel of a spacecraft have (1) suffered accident; (2) are experiencing conditions of distress; or (3) have made an emergency or intended landing on territory under its jurisdiction, on the high seas, or on any other place not under any State's jurisdiction.⁴⁴⁷ Further, the Agreement requires the provision of "rescue" and "all necessary assistance" by States Parties in cases where astronauts land in their territory by reason of "accident, distress, emergency, or unintended landing."⁴⁴⁸ This assistance is equally mandatory for landings on the high seas or other places not under the jurisdiction of any States, but only for those Contracting States "in a position to do so ... if necessary."⁴⁴⁹

⁴⁴⁵ Other than the *Moon Agreement*, discussed *infra*, the US and Russia are parties to four of the five multilateral treaties under the *corpus juris spatialis*.

⁴⁴⁶ Though the treaty does not specify whether the notifications to the launching authority and the U.N. Secretary General are conjunctive or disjunctive, the language of Article 2 requiring similar notifications is conjunctive.

⁴⁴⁷ *Rescue & Return Agreement*, Article 1, *supra* note 443, 672 U.N.T.S. 119 at 121.

⁴⁴⁸ Article 2, *ibid*. Article 2 further specifies that if assistance by the launching authority would "effect a prompt rescue or would contribute substantially to the effectiveness of search and rescue operations" it *shall* cooperate with the State Party in whose territory the astronaut has landed. This raises two observations. First, if the conditions for cooperation are satisfied, the launching authority must assist. Second, because "launch authority" is defined in part as "the State responsible for launching" (Article 6), it could constitute a State *other* than the astronaut's home state. For example, when the US launches Canadian, French, or Spanish astronauts on its Space Shuttle, should the occupants land in the territory of another contracting party by reason of "accident, distress, emergency, or unintended landing," the US as "launching authority" could be required under Article 2 to assist in any recovery efforts. Such efforts would then be "subject to the direction and control of the Contracting Party, which shall act in close and continuing consultation with the launching authority." Article 2, *ibid*. With respect to the treaty, its provisions, including the duty to rescue and assist, formally apply only to States Parties. However, by analogy with Maritime Law, it seems likely that this duty to assist astronauts in distress is rooted in customary international law. The duty to assist mariners on the sea has long been established both by treaty (e.g. 1910 Brussels Treaty) and custom and likely applies equally to astronauts.

⁴⁴⁹ Article 3, *ibid*. at 122.

With respect to "space objects," a term undefined by this or any other space treaty,⁴⁵⁰ the Agreement requires that notification be made to the launching authority following discovery of any space object within the territory of a contracting party, on the high seas, or any other place not under the jurisdiction of any State.⁴⁵¹ The treaty further requires that upon furnishing "identifying data," States Parties "shall" return space objects found beyond the territorial limits of the launching state.⁴⁵² However, while this provision would certainly require the return of space weaponry or satellites having landed back on Earth, it does not specify *when* such return must take place or in exactly what condition. Presumably, the treaty requires return within a reasonable time, though that could perhaps occur *after* a thorough inspection and analysis of the space object by the State possessing it. Because the treaty makes no distinction between civil and military astronauts or launchings, its terms apply equally to astronauts and space objects used for both purposes.

A significant issue arose in 1978 pertaining to the reentry of a nuclear-powered ocean reconnaissance satellite owned and operated by the Soviet Union – Cosmos 954.⁴⁵³ On 24 January 1978 the satellite crashed in Canada's Northwest Territories. According to the diplomatic exchanges following the incident, the US offered assistance "within 15 minutes."⁴⁵⁴ After some delay, Canada accepted the US offer of assistance but declined

⁴⁵⁰ The Liability Convention, *infra*, does define "space object" as including the "component parts of a space object as well as its launch vehicle and parts thereof." However in using the very term to be defined within the definition itself, the definition is so hopelessly circular that it amounts to no definition at all.

⁴⁵¹ *Rescue & Return Agreement*, Article 5(1), *supra* note 443, 672 U.N.T.S. 119 at 122.

⁴⁵² Article 5(3), *ibid*.

⁴⁵³ The satellite was designed for ocean reconnaissance and was powered by a "nuclear reactor working on uranium enriched with isotope of uranium-235." Statement of Claim by Canada, 23 January 1979, reprinted in I. Vlasic, ed., *Space Law and Institutions: Documents and Materials* (Montreal: Institute of Air and Space Law, McGill University, 1997) at 295. The Cosmos 954 crash was the first instance "in the history of space exploration where a claim was made by one sovereign state against another on account of damage caused by a falling space object." B. Schwartz & M.L. Berlin, "After the Fall: An Analysis of Canadian Legal Claims for Damage Caused by Cosmos 954" (1982) 27 McGill L. J. 676. The satellite contained over 50 Kg of enriched uranium suggesting it was not designed for reentry in 1978 but only after a long orbital lifetime.

⁴⁵⁴ US President Carter notified Canadian Prime Minister Trudeau and actually *repeated* an offer made prior to the satellite's reentry. A.F. Cohen, "Cosmos 954 and the International Law of Satellite Accidents" (1984) 10:1 Yale J. Int'l L. 78, 80. Not only does this suggest that the US had tracked the satellite to its reentry point, but that the US earnestly wanted an analysis of the Soviet spy satellite. Cohen reports that prior to the reentry, the Soviet Union secretly provided the US with information about the satellite's reactor, though this information was only formally provided to Canada months after the crash. See *ibid* at 179.

the Soviet offer.⁴⁵⁵ Instrumental in the exchanges was the language of Article 5(2). Though it required Canada to “take such steps as it finds practicable to recover the object or component parts,” the treaty allowed for Soviet assistance only “if requested.”⁴⁵⁶ Because Canada never made the request, the Soviet Union had no right to search for its property on Canadian soil (and thus protect it from discovery by the West).

Though intended as a clarification of the Outer Space Treaty, the Rescue and Return Agreement raises as many questions as it answers. One commonly raised question pertains the possibility that an astronaut landing in the territory of another State Party may wish to request political asylum. Though Article 4 does not seem to allow for this possibility, (“shall be safely and promptly returned”)⁴⁵⁷ other principles of international law contained in the U.N. Charter and Universal Declaration of Human Rights do. Though a few states took the position that the treaty did not extinguish the right to request asylum in connection with an unintended landing from space,⁴⁵⁸ most States, including the US rejected this position and maintained that the treaty created a specific exception to the asylum rules.⁴⁵⁹ Other questions raised by ambiguities in the Agreement include the following: “How should rescue expenses be treated?”⁴⁶⁰ Is the launching state obligated to reimburse the rescuing state? What if a rescue attempt is bungled – will the rescuing state be liable, or does some sort of Good Samaritan principle apply? Should there be such a principle, since rescue is mandatory?”⁴⁶¹ Though answers to each of these questions will not directly affect space warfare, they could do so indirectly as States make wartime

⁴⁵⁵ Indeed, though the Soviet Union expressed no interest in the return of the object and therefore claimed it had no obligation to provide “identifying data” under Article 5(3) (required prior to return of the object), it expressed regret that its “specialists” did not participate in the search and removal of the object. Christol, *Modern International Law of Outer Space*, *supra* note 423 at 179. Because no State has ever requested return of a space object from another, Article 5 has never been tested in practice.

⁴⁵⁶ *Rescue & Return Agreement*, Article 5(2), *supra* note 443, 672 U.N.T.S. 119 at 122.

⁴⁵⁷ Article 4, *ibid.* at 122.

⁴⁵⁸ Austria, supported by France, wished to continue to offer asylum in keeping with its “traditional policies toward aliens.” Christol, *Modern International Law of Outer Space*, *supra* note 423 at 175.

⁴⁵⁹ Reynolds & Merges, *supra* note 21 at 204. These States plausibly asserted that requests for asylum under conditions of the unintended landings specified in the treaty could be coerced, “particularly when the requestor is the victim of a recent space accident and may not be in full possession of his or her faculties.” *Ibid.*

⁴⁶⁰ Though the treaty requires such rescues for astronauts, unlike the case respecting searches for space objects under Article 5 and the subsequent Liability Convention it did not specify who pays for the rescue operation or in what proportion.

⁴⁶¹ Reynolds & Merges, *supra* note 21 at 204. Also, though its terms suggest application to living astronauts, the treaty does not answer whether a duty exists to return the remains of *expired* astronauts.

decisions in light of possible liability. The potentially significant issue of whether the Rescue and Return Agreement mandates return of astronauts in time of war is discussed in Chapter Six.⁴⁶²

3. Convention on the International Liability for Damage Caused by Space Objects (Liability Convention) – 1972

The longest of the space treaties at 28 articles, the Liability Convention takes as its goal an elaboration of “effective international rules and procedures concerning liability for damage caused by space objects and to ensure, in particular, the prompt payment under the terms of this Convention of a full and equitable measure of compensation to victims of such damage.”⁴⁶³ As with the Rescue and Return Agreement, the Liability Convention undertook an expansion of the Outer Space Treaty, in this case Article VII, which made a launching State “internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons” for damage caused by its space objects.⁴⁶⁴ With a few exceptions, the Liability Convention is likely to have only a tangential relationship to the regulation of space warfare.

The Convention sets up a two-tiered structure of liability. For damage caused by a space object on the surface of the earth or to an aircraft in flight, the launching State⁴⁶⁵

⁴⁶² See *infra*, Chapter Six, Section E.3.

⁴⁶³ *Convention on International Liability for Damage Caused by Space Objects*, 29 March 1972, 961 U.N.T.S. 187, 24 U.S.T. 2389, T.I.A.S. No. 7762, (from the Preamble) (entered into force 1 September 1972) [hereinafter *Liability Convention*].

⁴⁶⁴ *Outer Space Treaty*, Article VII, *supra* note 405, 610 U.N.T.S. at 209. Article VI of the *Outer Space Treaty* also provided the drafters of the *Liability Convention* some guidance in its assertion that States Parties “shall bear international responsibility for national activities in outer space....” Foster notes that the *Outer Space Treaty* left several questions unanswered: “(a) what flight instrumentalities are covered by the term ‘object?’; (b) what is meant by the phrase ‘internationally liable?’; (c) what regime will govern the liability of states engaged in a joint venture – will they be jointly and severally liable or only severally liable?; (d) what is encompassed by the term ‘damage?’; (e) how is an international organization to be responsible under the Treaty when it cannot become a party to, or even accept the obligations contained in the Treaty?; and (f) what mechanisms will be used to settle disputes arising when damage is caused?” W.F. Foster, “The Convention on International Liability for Damage Caused by Space Objects” (1972) 10 C.Y.I.L. (Vancouver: University of British Columbia Press, 1973) 137 at 143 n.3 [hereinafter Foster]. Of these, with the exception of the first, all have been clarified to some meaningful degree by the *Liability Convention*.

⁴⁶⁵ Defined more expansively than “launching authority” under the *Rescue and Return Agreement*, “launching state” under the *Liability Convention* includes (1) the state who launches a space object; (2) the state who procures the launch of a space object; and (3) the state from who’s territory or facility a space object is launched. *Liability Convention*, Article I(c), *supra* note 463, 961 U.N.T.S. at 189.

is "absolutely liable."⁴⁶⁶ Otherwise, the Convention provides fault-based liability "[i]n the event of damage being caused elsewhere than on the surface of the earth to a space object of one launching State or to persons or property on board such a space object by a space object of another launching State ..."⁴⁶⁷ As with all other space treaties, the Liability Convention makes no distinction between civilian and military space objects which could form the basis of a claim. Thus, not only military operations short of armed conflict, but space operations during war itself could form the basis of monetary claims under the Convention, provided the space object⁴⁶⁸ of the launching State caused "damage." Because the Convention defines the term broadly, to include "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organizations,"⁴⁶⁹ just about any damage directly caused by the space object will be compensable.

Other provisions establish the principle of joint and several liability;⁴⁷⁰ apportionment of liability for joint launchings;⁴⁷¹ conditions under which a launching state may be exonerated from absolute liability;⁴⁷² exclusions of liability;⁴⁷³ priority of presenting claims between a State on behalf of itself or national, territorial States on

⁴⁶⁶ *Liability Convention*, Article 2, *supra* note 463, 961 U.N.T.S. at 189. This significant provision was the first time that an international agreement provided for the possibility of attaching absolute liability to States.

⁴⁶⁷ Article 3, *ibid.* at 190.

⁴⁶⁸ As previously stated, the *Liability Convention's* definition attempts but fails to define the term. Though it would appear to include non-operational space debris, it leaves several unresolved issues. For example, it is unclear whether a space object is simply an object designed for travel in outer space. Foster notes that all of the draft definitions of "space object" in the COPUOS Legal Subcommittee "contained the criterion of being designed for movement in outer space." Foster, *supra* note 464 at 145. On this approach sounding rockets that fail to leave earth's atmosphere, and scientific equipment permanently left on the moon are not space objects. By contrast, a satellite in transit by rail that rolls off its platform causing damage would logically subject the State of origin to absolute liability. Though the *Liability Convention* attaches liability to "launching states" it does not specify that to be compensable the damage must occur during or after a launch. Further, because the *Liability Convention* definition of "space object" includes "component parts of a space object," it is unclear whether, for example, cargo and crew of a space object also qualify themselves as "space objects." They might if Christol is correct that "'component parts' is to be construed in a broad sense to include such property on board as would be conducive to the successful operation of the space object." Christol, *Modern International Law of Outer Space*, *supra* note 423 at 109. Because the Convention does not explicitly define the term "space object," these hypothetical scenarios raise potential future disputes over what types of objects can create liability.

⁴⁶⁹ *Liability Convention*, Article I(a), *supra* note 463, 961 U.N.T.S. at 189.

⁴⁷⁰ Article IV, *ibid.* at 190.

⁴⁷¹ Article V, *ibid.*

⁴⁷² Article VI, *ibid.*

⁴⁷³ Article VII, *ibid.* at 191.

behalf of non-nationals, and State of residency of victims;⁴⁷⁴ a one-year statute of limitations from the date of occurrence, identification of the launching state, or acquisition of facts by the injured State putting it on notice of the damage;⁴⁷⁵ and the availability of domestic remedies.⁴⁷⁶ Following this, the Convention provides seven articles on the establishment, compositions, and procedure of a "claims commission" for the adjudication of claims made under the convention.⁴⁷⁷ Though widely hailed as creating an equitable procedure for the resolution of liability claims, one of the Convention's "most publicized" defects was the failure to require that Claims Commission decisions would automatically bind litigants.⁴⁷⁸

Whether the Liability Convention has succeeded in achieving its goals remains to be seen. Though the Convention has specified a liability regime, it has never been used and thus cannot be judged "effective." The Cosmos 954 incident would have provided the first case study. However though it paid \$3,000,000 of the Canadian \$6,000,000 claim, the Soviet Union refused to engage in legal argumentation over the Convention's terms. Though the Convention does establish the international standard for compensation, and fixing the level of liability based on the spatial area in which the damage occurred, it is unlikely to affect a State's decision to use of force in space, or the selection of means and methods thereto.

4. Convention on Registration of Objects Launched into Outer Space (Registration Convention) – 1975

The Registration Convention establishes a mandatory system of registration for space objects launched into orbit and beyond.⁴⁷⁹ With reference to the Convention's preamble, one commentator cites two essential functions served by an international registration requirement: "(1) a well-ordered, complete and informative register would minimize the likelihood and even the suspicion of weapons of mass destruction being

⁴⁷⁴ Article VIII, *ibid.*

⁴⁷⁵ Article X, *ibid.*

⁴⁷⁶ Article XI, *ibid.*

⁴⁷⁷ Articles XIV through XX, *ibid.* at 192-193.

⁴⁷⁸ Christol, *Modern International Law of Outer Space*, *supra* note 423 at 112.

⁴⁷⁹ *Convention on the Registration of Objects Launched into Outer Space*, 14 January 1975, 1023 U.N.T.S. 15, 28 U.S.T. 695, T.I.A.S. No. 8480, (entered Into Force 15 September 1979) [hereinafter *Registration Convention*].

furtively put into orbit; (2) it is not possible to identify a spacecraft that has caused damage without an international system of registration.”⁴⁸⁰ Though the conclusion stated in the first point above seems overly optimistic, especially given the late reporting allowed under the Registration Convention, the second appears to be beyond question.

As with the previous two treaties discussed, the Registration Convention also clarifies a provision from the Outer Space Treaty. When establishing the principle that a launching state maintains jurisdiction and control in space over its launched objects, the Outer Space Treaty makes reference to the “registry” of States Parties.⁴⁸¹ Only in the 1975 Registration Convention did space law formally specify the requirement that States maintain a registry,⁴⁸² and the nature of its contents.

After defining “launching state,” “space object,” and “State of registry,”⁴⁸³ the Convention provides that each State will maintain an “appropriate registry” that contains an entry for all space objects “launched into earth orbit or beyond.”⁴⁸⁴ The Convention allows each State to determine the specific contents of its registry and the conditions under which it is maintained,⁴⁸⁵ however certain information must be provided for the registry kept by the United Nations Secretary General. Thus, the “heart” of the Convention, Article IV, specifies that launching States must provide the following information:

- (a) name of launching State or States;
- (b) an appropriate designator of the space object or its registration number;⁴⁸⁶
- (c) date and territory or location of launch;

⁴⁸⁰ Diederiks-Verschoor, *supra* note 387 at 41.

⁴⁸¹ *Outer Space Treaty*, Article VIII, *supra* note 405, 610 U.N.T.S. at 209.

⁴⁸² Arguably, the *Outer Space Treaty* implicitly required the maintenance of a registry simply because use of the term in the Treaty assumes that States maintain them. Yet, the matter was not stated as a requirement until 1975.

⁴⁸³ *Registration Convention*, Article I, *supra* note 479, 1023 U.N.T.S. at 17. The first two phrases are given definitions identical to those found in the *Liability Convention*.

⁴⁸⁴ Article II(1), *ibid.* This suggests that space objects, or other objects, launched into *sub-orbital* trajectories need not be registered. Technically, this would include objects failing to complete a single circumnavigation of the globe, as for example objects following a 180 or 270 degree arc, short of the complete 360 degree path required of “orbital” flights.

⁴⁸⁵ Article II(3), *ibid.*

⁴⁸⁶ Essentially, this information has been made optional in view of Article V which suggests that space objects may or may not carry identifying markings: “Whenever a space object launched into earth orbit or beyond is marked with the designator or registration number referred to in article IV, paragraph 1(b), ...” The obvious but unstated assumption flowing from “whenever” is that in some cases the object might be marked, in some cases it might not at the option of the launching state.

- (d) basic orbital parameters, including:
 - (i) nodal period,⁴⁸⁷
 - (ii) inclination,⁴⁸⁸
 - (iii) apogee,⁴⁸⁹
 - (iv) perigee,⁴⁹⁰
- (e) general function of the space object.⁴⁹¹

With respect to military launches, the Convention allows registry notifications to be sufficiently ambiguous so as to mask the true nature of the mission. The following two provisions of Article IV make this especially so: First, the fact that the information need only be provided “as soon as practicable,” which launching States may and do interpret as weeks or months following the launch;⁴⁹² and second, the fact that only the “general function” of the space object need be disclosed – a phrase interpreted, again, by the launching State. The room for ambiguity afforded by the Convention allows States to protect the identity of their military satellites, which perform an entirely legitimate function under the law.⁴⁹³ Writing euphemistically, Professor Diederiks-Verschoor

⁴⁸⁷ Also termed “orbital period.” “The time it takes a spacecraft or other object to circumnavigate Earth, ... High altitude circuits take longer to complete than low ones. Elliptical and circular orbits have equal periods, if the average of apogee and perigee altitudes is the same.” Collins, *supra* note 25 at 156.

⁴⁸⁸ Also termed “orbital inclination.” “The angle of a flight path in space relative to the equator of Earth, ... Equatorial paths are 0° for flights headed east, 180° for those headed west. Polar paths are 90°. All other paths overfly equal parts of the northern and southern hemispheres (from 50° N latitude to 50° S, for example).” *Ibid.*

⁴⁸⁹ “The maximum altitude attained by a spacecraft in elliptical orbit around Earth, its moon, or another planet.” *Ibid.* at 146.

⁴⁹⁰ “The minimum altitude attained by a spacecraft in elliptical orbit around Earth, its moon, or another planet. Spacecraft in [low earth orbit] attain maximum velocity at that point where Earth’s gravitational pull is strongest.” *Ibid.* at 157.

⁴⁹¹ *Registration Convention*, Article IV(1), *supra* note 479, 1023 U.N.T.S. at 17.

⁴⁹² In some cases, what is “practicable” may require delay for up to a year or more. During the prosecution of an international armed conflict, it would hardly be “practicable” for a belligerent to transmit the launch of its space objects to an opposing belligerent through the United Nations – precisely the practical result of such notifications made *during* the armed conflict given the fact that “[t]here shall be full and open access to the information in this [United Nations] Register.” (Article III(2)). On this interpretation of Article IV(1), a belligerent could avoid the difficult conclusion that the *Registration Convention* does not apply during armed conflicts, it could simply and reasonably apply the Convention’s own terms in the context of armed conflict. This interpretative approach to the *Registration Convention* is available to belligerents in any conflict, not merely those involving space combat. Thus, during Vietnam, the 1991 Persian Gulf war, and the 1999 Yugoslavian war, belligerents could legitimately delay notification to the U.N. Secretary General under Article IV until doing so provides no tactical advantage to the enemy. Once the military threat posed by earlier notification is passed, the notification becomes “practicable” for the State of registry.

⁴⁹³ Indeed, protection of the “national technical means” (including space reconnaissance capabilities) under the Anti-Ballistic Missile (ABM) treaty between the US and USSR, discussed *infra*, is the *sine qua non* of an effective verification structure. To the extent the ABM treaty should survive in its current form, the US and Russia must protect the secrecy of their space reconnaissance assets. The *Registration Convention* allows them to do this.

observes that “[t]he underlying reason for the reluctance [to provide specific information on reconnaissance satellites] is that States do not trust each other.”⁴⁹⁴ She opines that a State’s disclosure of spy satellite data to “the fullest possible” extent, with due regard to its national security interests, will perhaps allow registration to “overcome the suspicion barrier.”⁴⁹⁵ The problem with this understandably hopeful analysis, is that it overlooks the central point of a spy satellite – acquisition of information without the subject State’s knowledge. Once its existence and characteristics are published, its effectiveness as a instrument for spying diminishes. What Diederiks-Verschoor and other authors seem to be suggesting with this type of analysis is that space reconnaissance activities should simply be outlawed. Though that is a question beyond the scope of this review, it suffices to say that such activities have been recognized as lawful for decades and likely will for the foreseeable future.⁴⁹⁶

5. Agreement Governing the Activities of States on the Moon and other Celestial Bodies (Moon Agreement) – 1979

Of the five multilateral treaties devoted entirely to space, the Moon Agreement⁴⁹⁷ is the most recent and enjoys the least support.⁴⁹⁸ Additionally, the Agreement sheds little light on the international legal regime restricting space warfare beyond that contained in previous treaties. As a result, the Agreement is marginally relevant for international space law in general, and the military uses of space in particular. Nonetheless, the Agreement does contain provisions that could impact space warfare as persuasive authority for the creation of future international legal obligations on non-parties.

The Agreement reiterates for the Moon many of the principles found in the Outer Space Treaty including the notions of “province of all mankind,”⁴⁹⁹ exploration and use

⁴⁹⁴ Diederiks-Verschoor, *supra* note 387 at 42.

⁴⁹⁵ *Ibid.*

⁴⁹⁶ In addition to reconnaissance satellites, the vague reporting requirements could easily obscure the true nature of attack satellites as well.

⁴⁹⁷ *Agreement on the Activities of States on the Moon and Other Celestial Bodies*, G.A. Res. 34/68, U.N. GAOR, 34th Sess., Supp. No. 46, U.N. Doc. A/34/664 (1979) (entered into force 11 July 1984), reprinted at (1979) 18 I.L.M. 1434 [hereinafter *Moon Agreement*].

⁴⁹⁸ As of 1993, nine States had ratified the treaty, few of which are active in space and none of which are major actors. France signed but did not ratify the treaty.

⁴⁹⁹ *Moon Agreement*, Article 4(1), *supra* note 497, 18 I.L.M. at 1435; accord *Outer Space Treaty*, Article I.

carried out for the "benefit and interests of all countries,"⁵⁰⁰ the fact that the moon is "not subject to national appropriation by any claim of sovereignty, by means of use or occupation, or by any other means,"⁵⁰¹ and retention by States Parties of "jurisdiction and control" over their personnel and space vehicles.⁵⁰² Further, as with the Outer Space Treaty, the Moon Agreement requires that all activities on the moon be carried out in accord with "international law,"⁵⁰³ and that States bear "international responsibility for national activity" on the moon.⁵⁰⁴ Finally, both treaties specify that all stations, installations, equipment, and space vehicles "shall be open" to the other States Parties.⁵⁰⁵

The Agreement applies not only to the Moon, but to "other celestial bodies within the solar system, other than the earth."⁵⁰⁶ Though "celestial bodies" is nowhere defined in any of the space conventions, it would presumably include all planets, asteroids, and comets found within earth's solar system. This is suggested by the Agreement's exclusion from its scope of any "extraterrestrial materials which reach the surface of the earth by natural means."⁵⁰⁷ Significantly, the Agreement authorizes removal from the Moon of "samples" of "mineral and other substances."⁵⁰⁸ Though debate continues on the permissibility and propriety of harvesting lunar resources, there is no moratorium on doing so given the lack of support for the Moon Agreement.⁵⁰⁹

⁵⁰⁰ *Ibid.*; accord *Outer Space Treaty*, Article I.

⁵⁰¹ *Moon Agreement*, Article 11(2), *ibid.* at 1438; accord *Outer Space Treaty*, Article II.

⁵⁰² *Moon Agreement*, Article 12(1), *ibid.* at 1439; accord *Outer Space Treaty*, Article VIII (uses term "object" versus "vehicles, equipment, facilities, stations, and installations").

⁵⁰³ *Moon Agreement*, Article 2, *ibid.* at 1435; accord *Outer Space Treaty*, Article III.

⁵⁰⁴ *Moon Agreement*, Article 14(1), *ibid.* at 1439; accord *Outer Space Treaty*, Article VI.

⁵⁰⁵ *Moon Agreement*, Article 15(1), *ibid.*; accord *Outer Space Treaty*, Article XII. The *Moon Agreement* adds a fifth category, facilities, to the list of items open to States Parties.

⁵⁰⁶ *Moon Agreement*, Article 1(1), *ibid.* at 1434.

⁵⁰⁷ Article 1(3), *ibid.* at 1435.

⁵⁰⁸ Article 6(2), *ibid.* at 1436. Unfortunately, the treaty does not define "sample." Thus it is not clear from the treaty's terms either what sized object constitutes a "sample" (1 cm? .5 meters? 10 meters? 100 meters?) or how many samples may be removed. Article 6(2) goes on to state that "States Parties may in the course of scientific investigations also use mineral and other substances of the moon in quantities appropriate for the support of their missions." While this comes close to providing guidance on a permissible amount, the fact that minerals and substances may "also" be used in this way suggests that it is *in addition* to the taking and retaining of samples. Thus, there is no clear answer.

⁵⁰⁹ The US Apollo 11 Moon landing in 1969 is regarded as providing the first major impetus toward negotiating a specific treaty governing Moon activities. The negotiators were motivated in part by "an awareness that tangible Moon rocks were being returned to Earth, the possibility that mineral and other substances, as well as intangible resources, might be exploited, and speculation that it might be possible to establish human habitations on the Moon." Christol, *Modern International Law of Outer Space*, *supra* note 423 at 246. The provision allowing for limited exploitation of the Moon's resources came at the expense of

Regarding military activity, the Agreement forbids the placement of weapons of mass destruction, including nuclear weapons, on the moon itself, in orbit around the moon, or on trajectories to and around the moon, and on other celestial bodies.⁵¹⁰ Further, the Agreement's military provisions do not prohibit the placement of weapons in outer space in general, only weapons of mass destruction. The Agreement's language pertaining to military usage does however largely mirror Article IV of the Outer Space Treaty. Requiring that the use of the moon be "exclusively for peaceful purposes," the Moon Agreement continues "any threat or use of force or any other hostile act or threat of hostile act on the moon is prohibited."⁵¹¹ Given the fact that the Agreement already specified that activity on the moon must occur pursuant to international law, and the provision on the "threat or use of force" simply parrots the language of Article 2(4) under the U.N. Charter, one wonders why this language was necessary. The reference to "any other hostile act or threat of hostile act" was new in 1979, suggesting that under the Moon Agreement a "peaceful" use will be a non-hostile use.

Perhaps the most significant feature of the Agreement of an enduring character is its articulation of the "common heritage of mankind" concept. Article 11 begins: "The moon and its natural resources are the common heritage of mankind."⁵¹² Though articulated within the U.N. in the 1960s,⁵¹³ the common heritage of mankind (hereinafter CHM) principle found its first expression of a legally binding character in the Moon Agreement. Though not equivalent to the "province of mankind" language found in the

proposals by some developing countries to outlaw the exploitation of natural resources in space except under the auspices of an international regime.

⁵¹⁰ *Moon Agreement*, Article 3(3), *ibid.* at 1435. The prohibition on orbiting weapons of mass destruction around the Moon was thought to close a gap left by Article IV of the *Outer Space Treaty*. The latter outlawed the orbiting of weapons of mass destruction around the earth, and the installation or stationing of such weapons on celestial bodies or in outer space. Though the prohibition on *stationing* weapons of mass destruction "in outer space" could be read to foreclose the lawfulness of orbiting, for example, a nuclear weapon around the Moon, the OST did not specifically forbid orbiting of the Moon by nuclear or other weapons of mass destruction. The *Moon Agreement* did.

⁵¹¹ Article 3(2), *ibid.*

⁵¹² Article 11, *ibid.* at 1438.

⁵¹³ As applied to outer space, the concept first arose in July 1967 at the behest of the Ambassador of Argentina, Aldo Armando Cocca, in discussions held with the COPUOS Legal Subcommittee. "A few months later, the Maltese Ambassador to the United Nations, Arvid Pardo, applied the principle to the law of the sea when he stated that the seabed was the 'common heritage of mankind.' The concept was formalized first in the 1979 Moon Agreement, and subsequently in the 1982 Law of the Sea Convention." Jasentuliyana, "Developing Countries," *supra* note 408 at 106. Prior to this, the CHM concept appeared in a 1970 U.N.G.A. resolution declaring principles governing the seabed and subsoil beneath it.

Outer Space Treaty,⁵¹⁴ the CHM principle bears some similarities. According to Jasentuliyana, the CHM theory has a specific meaning when applied to the Moon Agreement and identifies five characteristics for territory designated as such: (1) it is not subject to State appropriation; (2) it is jointly managed by all States; (3) all States should equitably share in the benefits reaped from the exploitation of the resources of the areas; (4) the areas must be dedicated exclusively to peaceful purposes; and (5) the CHM should be conserved for future generations.⁵¹⁵

Throughout its history, the CHM principle in international law has proven controversial. For the developing states, the concept as applied to space is an important protection against the "first-come-first-served" approach taken by the spacefaring States. For those States active in space, particularly Western States desirous of stimulating private investment, the concept is a threat to the economical exploitation of space

⁵¹⁴ During negotiations over the Moon Treaty, the Argentinean delegation submitted a working paper in which it proposed that the merit in "replacing the vague expression 'province of mankind' by the more meaningful expression 'common heritage of mankind' is that in doing so one has specified the commencement of an action, replacing an abstract statement by a means of operating, within a specified legal framework." Quoted in Jasentuliyana, "Developing Countries," *supra* note 408 at 107-108. Perhaps Diederiks-Verschoor puts the distinction best: "The 'province of mankind' must be identified as a general political principle with certain moral overtones, meant to govern rights and duties in outer space. Its legal substance, according to Article I [of the *Outer Space Treaty*] is international cooperation and use of outer space without discrimination of any States, and the duty to take into account the interests of other States. The scope of the term 'common heritage' is much more restricted in legal terms, covering only the exploitation of the moon's natural resources." Diederiks-Verschoor, *supra* note 387 at 45. As usual, professor Christol gets to the heart of the matter: "[despite commonalities] it is evident that the two principles carry separate and distinct characteristics. The province of mankind principle is linked to the *res communis* principle which allows for the exploration, use, exploitation, and voluntary sharing of common resources. On the other hand, the Common Heritage of Mankind principle, as contained in the *Moon Agreement*, may be characterized as a "*res communis* plus" principle in the sense that successful explorers, users, and exploiters of the moon and its natural resources will be obligated to conform to the decisions of the international legal regime identified in Article 11 of that agreement. ... The province of mankind principle does not contemplate the formation of an international inter-governmental body or that there be an obligatory sharing of the tangible acquisitions of Moon and celestial body activity." C.Q. Christol, "Important Concepts for the International Law of Outer Space" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 73 at 80.

⁵¹⁵ Jasentuliyana, "Developing Countries," *supra* note 408 at 106-107. For more detailed analyses, see G.M. Danilenko, "The Concept of the Common Heritage of Mankind in International Law" (1988) XIII Ann. Air & Sp. L. 247; N. Jasentuliyana, "The U.N. Space Treaties and the Common Heritage Principle" (1986) 2 Sp. Pol. 296; A. Cocca, "The Common Heritage of Mankind: Doctrine and Principle of Space Law - An Overview" in *Proceedings of the 29th Colloquium of the Law of Outer Space* (New York: American Institute of Aeronautics and Astronautics, Inc., 1986) 17; N.M. Matte, "Limited Aerospace Natural Resources and their Regulation" (1982) VII Ann. Air & Sp. L. 379; K.B. Walsh, "Controversial Issues Under Article XI of the Moon Treaty" (1981) VI Ann. Air & Sp. L. 489; and S.M. Williams, "The Common Heritage of Mankind and the Moon Agreement - Economic Implications and Institutional Arrangements" in *Proceedings of the 24th Colloquium on the Law of Outer Space* (New York: American Institute of Aeronautics and Astronautics, Inc., 1981) 87.

resources. The attempt to institute a legal regime based on an (undefined) "equitable sharing" of the Moon's natural resources creates uncertainty, which, in turn, stifles commercial interest. This problem is particularly acute given the Agreement's specification that the proposed international regime to govern exploitation of the moon's resources⁵¹⁶ is to be established "as such exploitation is about to become feasible."⁵¹⁷ Uncertainty over the terms of an international regime was largely responsible for the US decision not to sign the Moon Agreement.⁵¹⁸ Ultimately, the conclusion reaches by Reynolds & Merges appears plausible: "[a]bsent adoption by the major space powers, the Moon treaty is unlikely to play a major role in the future."⁵¹⁹

⁵¹⁶ The Agreement calls for an international regime whose purposes include: (1) The orderly and safe development of the natural resources of the moon; (b) The rational management of those resources; (c) The expansion of opportunities in the use of those resources; and (d) an equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the moon, shall be given special consideration. *Moon Agreement*, Article 11(7), *supra* note 497, 18 I.L.M. at 1438.

⁵¹⁷ *Ibid.*

⁵¹⁸ Indeed, friction between the US and USSR did not help the prospects for ratification. Although the other leading global space power, and presumably capable of developing the means to exploit the Moon's natural resources, the USSR generally sided with the interests of the developing States. Although both against incorporation of the CHM principle, the US and USSR could not even agree on whether exploitation could begin before establishment of the international regime called for in Article 11, the US position, or not, the Soviet position. See Diederiks-Verschoor, *supra* note 387 at 46. For further information on the debates within the US Senate and State Department, see M.L. Nash, "Contemporary Practice of the United States Relating to International Law: Moon Treaty" (1980) 74 Am. J. Int'l L. 418 at 421-426. Though the State Department supported the Agreement, a large number of space interest groups mounted a tremendous protest to the implications of the CHM principle. What is most surprising is that despite the strong objection to the CHM principle coming from the US, "the U.S. delegation in COPUOS was the main architect [of the concept]." D. Goedhuis, "Some Recent Trends in the Interpretation and the Implementation of the Rules of International Space Law" (1981) 19 Col. J. Transnat'l L. 213 at 231. See also C. Christol, "Current Developments: The Moon Treaty Enters Into Force" (1985) 79:1 Am. J. Int'l L. 163.

⁵¹⁹ Reynolds & Merges, *supra* note 21 at 116.

Chapter Five: Space Warfare Under Related Treaties and Other Authoritative Sources

No one can predict with certainty what the ultimate meaning will be of the mastery of space.⁵²⁰

President John F. Kennedy (1961)

In addition to the treaties and customary law dealing specifically with outer space, a few other treaties not previously discussed contain provisions relevant to the prospect of warfare in space. Also, several U.N.G.A. resolutions have, in some cases quite specifically, revealed the opinion of States on permissible activities in space. These sources are the focus of this chapter, which, though not formally part of the *corpus juris spatialis*, play a significant role in explicating the full range of international norms relevant to space warfare.

A. Treaties

1. Treaty Banning Nuclear Weapons in the Atmosphere, In Outer Space and Under Water (Limited Test Ban Treaty) – 1963

Adopted before any of the “space” treaties, the “Limited Test Ban Treaty”⁵²¹ nonetheless provided the first treaty provision governing the use of outer space. Despite being the subject of numerous UNGA resolutions renouncing the use or testing of nuclear weapons, until the Treaty entered force in late 1963 any of the nuclear weapons-capable States were legally free to detonate their warheads anywhere they wished.⁵²² The Treaty

⁵²⁰ J.F. Kennedy, *Public Papers of the Presidents of the United States: John F. Kennedy, 1961* (Washington: US Government Printing Office, 1962) at 405.

⁵²¹ *Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Underwater*, United States, United Kingdom and Soviet Union, 5 August 1963, 480 U.N.T.S. 43, 14 U.S.T. 1313 (entered into Force 10 October 1963, later joined by numerous additional states); reprinted in (1963) 2 I.L.M. 889 [hereinafter *Limited Test Ban Treaty*]. As the title suggests, the Treaty effected a “limited” ban on nuclear testing in that it did not restrict detonations under ground. Important as its restrictions on space activities are, some scholars refer to it as a sixth space treaty. E.g., Reijnen, *supra* note 417 at ix.

⁵²² The only limitation of course being those locations where the detonation would constitute an illegal use of force under the *jus ad bellum*, or means and method of warfare against foreign property or persons in violation of the *jus in bello*. Because France and China never signed the treaty, they would in theory still be free to initiate detonations in the atmosphere, under water, or in outer space. Such activity would of course have to overcome the strong argument that doing so violates customary international law, including that related to environmental protection. France continued to test on the high seas until 1973. Though Australia sought a declaration from the International Court of Justice that such testing violated international law, the Court determined the issue moot when France declared it would carry out no further such testing in the

forbids “nuclear weapon test explosion[s], or any other nuclear explosion[s] ... (a) in the atmosphere; beyond its limits, *including outer space*; or underwater, including territorial waters or high seas; or (b) in any other environment if such explosion causes radioactive debris to be present outside the territorial limits of the State under whose jurisdiction or control such explosion is conducted. ...”⁵²³ The Treaty went on to express hope that the parties would conclude a comprehensive treaty permanently banning all nuclear test explosions, “including all such explosions underground.”⁵²⁴

While of great military significance the Treaty was essentially aimed at the prevention of global nuclear contamination.⁵²⁵ Thus, although having the effect of an arms control agreement, the Limited Test Ban Treaty can “be viewed primarily as an environmental agreement rather than a military one. ...”⁵²⁶ This primary aim of the drafters comes into perspective when one considers the scope of nuclear testing that had gone on previously.⁵²⁷ Between them, the United States and Soviet Union conducted 212 nuclear explosions between 1945 and 1958. With the exception of 18 detonations, all occurred in the atmosphere.⁵²⁸

The Treaty establishes three significant implications for space warfare. First, while the treaty prohibits all nuclear detonations in space, even those that may have value for peaceful military or scientific purposes, it does not regulate detonations of a non-nuclear nature such as those pertaining to conventional, biological, chemical, or high

South Pacific. See *Nuclear Test Cases (Australia v. France; New Zealand v. France)* [1974] I.C.J. Rep. 253 at 457.

⁵²³ *Limited Test Ban Treaty*, *supra* note 521, 480 U.N.T.S. 43 at 45 [emphasis added]. Interestingly, the drafters sidestepped the issue of where space begins by simply forbidding detonations within the atmosphere and “beyond its limits, including outer space.”

⁵²⁴ *Ibid.* at 45, 47. Though submitted to the US Senate by the Clinton administration, the United States has yet to ratify the “Comprehensive Test Ban Treaty.”

⁵²⁵ Of course, negotiators were not oblivious to the clear military implications as well. Jankowitsch writes: “In 1962, the international community was jolted and the situation changed dramatically when the first nuclear weapon was tested in outer space. Suddenly, the extension of the arms race into outer space posed a real and present threat to international peace and security, ...” Jankowitsch, “Legal Aspects of Military Space Activities” in Jasentuliyana, *Space Law*, *supra* note 373 at 143.

⁵²⁶ Reynolds & Merges, *supra* note 21 at 54.

⁵²⁷ Although one of his highest priorities as President, Dwight D. Eisenhower declared the failure of his administration to secure a nuclear test ban “the greatest disappointment of any administration – of any decade – of any time and of any party.” Quoted in a piece commenting on the urgency of ratifying the *Comprehensive Test Ban Treaty*. P.H. Nitze & S.D. Drell, “This Treaty Must Be Ratified” *The Washington Post* (21 June 1999) 19.

energy laser weapons.⁵²⁹ Second, because the treaty outlaws “any nuclear weapon test explosion, or any other nuclear explosion” [emphasis added], it may prohibit the use of nuclear fission as a means of space propulsion.⁵³⁰ To the extent nuclear power sources operate by means other than “explosion,” the Treaty does not prohibit their use. Finally, the Treaty also prohibits the use of nuclear explosions for non-testing purposes as well. Thus, although, for example, the creation of an electromagnetic pulse in space by means of a nuclear detonation may present strategic military advantage, particularly in an anti-satellite role, such activity is forbidden by the treaty.⁵³¹

2. Anti-Ballistic Missile (ABM) Treaty – 1972

The ABM Treaty severely limits the deployment, testing, and use of missile systems designed to intercept incoming strategic ballistic missiles.⁵³² At the time of its adoption in 1972, the Soviet Union and the US believed that the best way to avert the possibility of a nuclear exchange, as well as to curb the urge to continue a nuclear arms buildup, was to render each side defenseless to a nuclear attack. The two States agreed that just as the actual ability to defend with an ABM system would create strategic instability, even the *perception* that the other has the ability would be destabilizing.⁵³³ Thus, with one exception, the two sides agreed to outlaw the testing, development,

⁵²⁸ See N.M. Matte, “The Treaty Banning Nuclear Weapons Tests in the Atmosphere, in Outer Space and Under Water (10 October 1963) and the Peaceful Uses of Outer Space” (1984) IX Ann. Air & Space L. 391 at 397. The Soviets did not begin their testing until 29 August 1949.

⁵²⁹ Reynolds & Merges, *supra* note 21 at 59.

⁵³⁰ *Ibid.* at 61. The authors note that the United States abandoned its experimentation on the ORION nuclear propulsion system after ratification of the treaty. Such system used small atomic bombs as fuel. A similar process is thought to fuel the X-ray laser developed as part of the Strategic Defense Initiative. See *supra* note 438. The US Congressional Office of Technology Assessment opined in 1985 that existing international law prohibits “the testing or deployment in space of nuclear space mines or ASATs that would require a nuclear detonation as a power source.” United States Congress, *Anti-Satellite Weapons, Countermeasures, and Arms Control* (Washington, DC: Office of Technology Assessment, 1985) at 21. The basis of this conclusion is likely not the OST’s ban on the orbiting or stationing of “nuclear weapons” in space, the definition of which is reasonably open to interpretation, but the *Limited Test Ban Treaty’s* ban on nuclear detonations in space.

⁵³¹ Reynolds & Merges note that because electromagnetic pulses are not dissipated in space, a single two-megaton bomb exploded at 50 km or higher above the earth could affect the circuits of nearly all satellites up to the geostationary orbit. *Ibid.* at 59. While military satellites are shielded against such threats, commercial satellites usually are not. Of course, the treaty does not prohibit all explosions in space, only those generated by nuclear power.

⁵³² *Treaty on the Limitation of Anti-Ballistic Missile Systems*, United States and Union of Soviet Socialist Republics, 26 May 1972, 23 U.S.T. 3435, T.I.A.S. 7503 (entered into force 3 October 1972) [hereinafter *ABM Treaty*].

deployment, and use of ABM systems.⁵³⁴ The exception allows each side to maintain one ABM system either around its national capital, or an ICBM site.⁵³⁵ Although the Preamble to the treaty cites a desire to decrease "the risk of outbreak of war involving nuclear weapons,"⁵³⁶ the Treaty applies to defenses guarding against conventional weaponry carried by ballistic missiles as well.

The two primary provisions impacting space activity are Articles V and XII. Article V(1) provides that "[e]ach party undertakes not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based, or mobile land-based."⁵³⁷ Though there were no space-based ABM systems in existence in 1972 when the Treaty was adopted, the space program of each Party was highly advanced and each could foresee the use of space-based ABM systems.⁵³⁸ Article XII is perhaps even more significant to the long-term use of space by military systems beyond the more narrow question of ABM systems:

1. For the purpose of providing assurance of compliance with the provisions of this Treaty, each Party shall use national technical means of verification at its disposal in a manner consistent with generally recognized principles of international law.

⁵³³ Reynolds & Merges, *supra* note 21 at 96.

⁵³⁴ *ABM Treaty*, Articles I & II, *supra* note 532, 23 U.S.T. at 3438-3439. As would become significant in 1983, the Treaty did not prohibit research into ABM systems.

⁵³⁵ Article III, *ibid.* at 3440, as amended. The treaty originally allowed two ABM systems having a radius of 150 km or less. This was reduced to one, by protocol of 1974. See *Limitation of Anti-Ballistic Missile Systems*, United States and Union of Soviet Socialist Republics, 3 July 1974, 27 U.S.T. 1645, T.I.A.S. 8276 (entered into force 24 May 1976). The Protocol specified that the US would not deploy an ABM system in the area centered on its capital, while the Soviet Union would not deploy a system in the deployment area of its ICBM silo launchers. Article I, *ibid.* at 1648. While the US explored the development of a system as authorized by the Treaty, it never fielded one. By contrast, the Soviet Union did field one around Moscow. In addition, the US suspected at least one other site maintained by the Soviets that was not authorized under the Treaty. As Shukman notes, "Mikhail Gorbachev was forced to admit, after years of denials, that one large radar, built near Krasnoyarsk in Siberia, was in breach of the agreement." Shukman, *supra* note 86 at 57. Previously, the Soviets maintained that the phased-array radar system (that is, a system with a radar beam that can be steered electronically and can shift rapidly from one target to another) was not designed for ABM purposes. In a meeting with US Secretary of State Baker subsequent to Gorbachev's admission, Foreign Minister E. Shevardnadze declared the Soviet Union's decision to begin dismantling of the Krasnoyarsk radar which occurred thereafter. See E. Agaev, "Future Situation in Outer Space" in N.M. Matte, ed. *Space Without Weapons* (Montreal: McGill University, Center for Research of Air and Space Law, 1989) 162.

⁵³⁶ *ABM Treaty*, *supra* note 532 at 3437.

⁵³⁷ Article V(1), *Ibid.*

⁵³⁸ Reynolds & Merges, *supra* note 21 at 97.

2. Each Party undertakes not to interfere with the national technical means of verification of the other Party operating in accordance with paragraph 1 of this Article.
3. Each Party undertakes not to use deliberate concealment measures which impede verification by national technical means of compliance with the provisions of this Treaty. This obligation shall not require changes in current construction, assembly, conversion or overhaul practices.⁵³⁹

Paragraph 1 is significant in numerous respects, not least of which is the codification of the "open skies" principle. With this provision, not only was the legality of space-based surveillance via satellite formally acknowledged, but such satellites "became an essential component of the international arms-control regime."⁵⁴⁰ The legality of military surveillance activity from space was established in international law previous to the ABM Treaty, however it is certainly accurate to say that the Treaty gave formal sanction to the practice by the two leading spacefaring States.

The requirement under Article XII(2) that the Parties not interfere with the "national technical means" of the other Party can be viewed in part as a specification of the "peaceful purposes" limitation of the Outer Space Treaty. That is, any proposed destruction of a Party's national technical means, including surveillance satellites,⁵⁴¹ by the other, except pursuant to self-defense or U.N. Security Council resolution on the use of force,⁵⁴² would certainly constitute an "interference" with that system as well as a violation of the "peaceful purposes" mandate. In this way the ABM Treaty acts as a partial limitation on the uses of anti-satellite capability maintained either by the US or Russia.

⁵³⁹ *ABM Treaty*, Article XII, *supra* note 532 at 3443.

⁵⁴⁰ Reynolds & Merges, *supra* note 21 at 97.

⁵⁴¹ "The term 'national technical means' (NTM) embraces a variety of technical information-gathering methods for monitoring both military activities and armaments subject to verification. NTM consists, most importantly, of satellites, ships, aircraft and ground-based radar stations, as well as other technical devices. ... Of course, neither side entirely relies only on its technical means of verification; many additional methods for collecting intelligence are also used to complement the information obtained by technical means." I.A. Vlasic, "Verifying Compliance With Arms Control Agreements: Whatever Happened to 'ISMA'?" in N.M. Matte, ed., *Arms Control and Disarmament in Outer Space* (Montreal: McGill University, Center for Research of Air and Space Law, 1985) 191.

⁵⁴² The latter possibility is practically zero given the fact that both Parties to the Treaty maintain a veto over any Security Council resolutions on the use of force.

Those following debates on missile defense in the United States will immediately recognize that the ABM Treaty has been widely criticized.⁵⁴³ Indeed the US Secretary of Defense recently announced that if Russia⁵⁴⁴ fails to agree to modifications to the Treaty to allow for a minimal missile defense system, the US reserves the right to withdraw from the Treaty altogether. Significantly, the treaty provides that "[e]ach Party shall, in exercising its national sovereignty, have the right to withdraw from this Treaty if it decides that extraordinary events related to the subject matter of this Treaty have jeopardized its supreme interests. It shall give notice of its decision to the other Party six months prior to withdrawal from the Treaty. Such notice shall include a statement of the extraordinary events the notifying Party regards as having jeopardized its supreme

⁵⁴³ Recent published criticisms include the following: C. Krauthammer, "The ABM Trap" *The Washington Post* (2 July 1999) 27 [hereinafter Krauthammer]; R.K. Bennett, "Needed: Missile Defense" *Reader's Digest* (July 1999) 117 [hereinafter Bennett]; J. Hackett, "Urgent Need to Exit ABM Treaty" *The Washington Times* (11 June 1999) 19; "Where's the Treaty?" *The Wall Street Journal* (10 May 1999) 22; J. Skrllec, "ABM Pact Outdated, Kissinger Tells Panel: Rogue States Pose Threat" *The Washington Times* (27 May 1999) 15. These sources show that in addition to the growing chorus of criticism from the US public and Congress, critics include those having negotiated the treaty itself including Henry Kissinger and John Rhinelander. Critics point to the threat to US cities of missile attacks by nations such as North Korea, Iran, and Pakistan. Even those skeptical of the technical feasibility of ABM systems are witnessing recent system successes. As of May 1999, the "hit-to-kill" rate for high altitude ABM interceptors was 13% (2 hits in 15 attempts). See, J. Mendelsohn, "Missile Defense: And It Still Won't Work" *The Bulletin of the Atomic Scientists* (May/June 1999) 29. However, a successful 10 June 1999 test firing of the Army's Theater High-Altitude Area Defense system (THAAD), showed, according to program manager Brigadier General Richard Davis, that the US now has "the guidance control, accuracy and the processing that allows us to hit a bullet with a bullet." P. Shenon, "After Six Failures, Test Of Antimissile System Succeeds" *The New York Times* (11 June 1999) 1; see also "Thaad Seeker Views Hera Target Before Hit-to-Kill Intercept" *AW&ST* 150:26 (28 June 1999) 42; "World News Roundup" *AW&ST* 150:24 (14 June 1999) 56. The technical implications of this recent success are still unclear. However, as with early critics of ICBM or satellite technology who predicted such innovations were not feasible, the drive to accomplish each was simply a matter of scientific and fiscal willpower. It is likely the quest for a technically feasible national missile defense system will follow a similar course. The strategic implications are more apparent. A single THAAD missile battery could defend Taiwan while three batteries could defend the entire island of Japan. J. Hackett, "What the THAAD Hit Means," *The Washington Times* (15 June 1999) 18. Despite its potential benefits, the Treaty is widely viewed as blocking the acquisition of any meaningful missile defenses – its principal purpose. "Effective missile defense requires very powerful radars to 'see' an attack as clearly as possible, and the direct networking of far-flung radars to share information on how and where interceptions should take place. But these are restricted or prohibited by the ABM treaty. Effective defense would employ interceptor rockets beyond those at a central site, some perhaps based at sea or even orbiting in space. These rockets would be fed information from satellite radars and other space-based sensors to aid interception at the earliest possible moment. The ABM treaty prohibits such dispersal, restricts the speed of such interceptors and most likely would not allow such use of sensors on satellites." Bennett, *ibid.* at 118.

⁵⁴⁴ Following the dissolution of the Soviet Union in 1991, Russia became the successor State to the former Soviet Union's rights and obligations under the Treaty.

interests.”⁵⁴⁵ Certainly, in case of war with the other Party or any other State, the Parties’ “supreme interests” would be jeopardized, allowing for withdrawal. Whether the proliferation of ICBMs to States hostile to the US jeopardizes its supreme interests is now under intense debate in the US.⁵⁴⁶

Recently, both houses of the United States Congress have overwhelmingly passed a bill that would enshrine into US national security policy the fielding of a national missile defense system.⁵⁴⁷ The bill commits the United States to fielding a missile defense system “when technically feasible,” and representatives of the President indicate he will “in all likelihood” sign the bill into law.⁵⁴⁸ The move represents a dramatic escalation in the US quest for missile defense – a quest begun by President Reagan in 1983 with the announcement of preliminary research into a “peace shield” to guard against foreign missile threats.⁵⁴⁹ With missile defense technology “near an historic

⁵⁴⁵ *ABM Treaty*, Article XV(2), *supra* note 532 at 3446. Recent signs show that withdrawal by the US may not be necessary. After repeatedly objecting to US requests for a renegotiation of the Treaty so as to allow for a national missile defense, Russia now appears willing to discuss the matter. J. Gerstenzang, “Clinton, Yeltsin OK New Look at Arms Treaties” *The Los Angeles Times* (21 June 1999) 1. Whether these will result in meaningful progress remains to be seen as arms control experts term them “more exploratory than substantive.” P. Mann, “Serious Pursuit?” *AW&ST* 150:26 (28 June 1999) 25.

⁵⁴⁶ For example, it was recently discovered that the North Korean ICBM program maintains a 3-stage rocket capability. It’s Taepo-Dong missile travels at 7 to 8 km per second, faster than the THAAD ABM system could counter. Krauthammer, *supra* note 543.

⁵⁴⁷ E. Becker, “House Approves Star Wars Defense System” *The New York Times* (21 May 1999) 1.

⁵⁴⁸ *Ibid.*

⁵⁴⁹ Characteristically, Reagan communicated his disagreement with the assumptions made by the ABM Treaty in simple, populist terms. His views, articulated almost 17 years ago, typify the current widespread disaffection with the treaty: “I’ve become more and more deeply convinced that the human spirit must be capable of rising above dealing with other nations and human being by threatening their existence. ... If the Soviet Union will join with us in our effort to achieve major arms reductions, we will have succeeded in stabilizing the nuclear balance. Nevertheless, it will still be necessary to rely on the specter of retaliation, on mutual threat. And that’s a sad commentary on the human condition. Wouldn’t it be better to save lives than to avenge them? ... I clearly recognize that defensive systems have limitations and raise certain problems and ambiguities. If paired with offensive systems, they can be viewed as fostering an aggressive policy, and no one wants that. But with these considerations firmly in mind, I call upon the scientific community in our country, those who gave us nuclear weapons, to turn their great talents now to the cause of mankind and world peace, to give us the means of rendering these nuclear weapons impotent and obsolete. ... My fellow Americans, tonight we’re launching an effort which holds the promise of changing the course of human history. There will be risks, and results take time. But I believe we can do it. As we cross this threshold, I ask for your prayers and your support.” R. Reagan, “Peace and National Security” Address to the Nation of 23 March 1983, reprinted in A. Long, D. Hafner & J. Boutwell, eds., *Weapons in Space* (New York: W.W. Norton & Company, 1986) at 351-353. Well before the President’s “Strategic Defense Initiative” (as the program would later be called) speech, derisively termed “star wars” by members of the news media, ABM research had been underway. “As early as the 1950s, Pentagon planners first suggested fielding anti-missile missiles.” Shukman, *supra* note 86 at 55.

phase in its favor” after decades of failures, pressure to renegotiate or withdraw from the treaty will continue to mount.⁵⁵⁰

3. Antarctic Treaty – 1959, and the United Nations Convention on the Law of the Sea – 1982

Those looking for analogous legal regimes to that contemplated for outer space, often cite the regimes established for the continent of Antarctica and for the high seas. Of the two, the high seas receive particular attention. Not too long ago, the high seas seemed as vast to explorers as outer space does today. But in addition to their vastness, the freedom of movement thereon mirrors the freedom of movement reserved in law for outer space. Thus, one commentator notes the “maritime antecedents” of the freedoms of outer space.⁵⁵¹

With respect to the status of the high seas, the United Nations Convention on the Law of the Sea (LOS Convention), the most comprehensive treaty ever created, largely mirrors customary international law.⁵⁵² Among its other numerous categories, it establishes the legal status for the high seas – the vast majority of the world’s oceans which are free of any territorial claims or superior rights or interests by any one State. As with the legal status for outer space, the LOS Convention articulated the “freedom” of all States to traverse the high seas unimpeded.⁵⁵³ Thus, under international law the high seas constitute an area that is *res communis omnium* – territory free for equal use by all States.

⁵⁵⁰ P. Mann, “Historic Turn Eyed in Missile Defense” *AW&ST* 151:1 (5 July 1999) 30. Specific improvements noted include radar capability and data processing, optical systems, lasers and sensors, and miniaturization of crucial missile defense components such as rocket thrusters. *Ibid.*

⁵⁵¹ H. DeSaussure, “The Freedoms of Outer Space and Their Maritime Antecedents” in Jasentuliyana, *Space Law*, *supra* note 373 at 1.

⁵⁵² *United Nations Convention on the Law of the Sea*, 10 December 1982, 1833 U.N.T.S. 3, (1982) 21 I.L.M. 1261 (entered into force 16 November 1994) [hereinafter *LOS Convention*].

⁵⁵³ Article 87 states that “The high seas are open to all States, whether coastal or land-locked. Freedom of the high seas is exercised under the conditions laid down by this Convention and by other rules of international law. It comprises, *inter alia*, ... (a) freedom of navigation; (b) freedom of overflight; ...” *Ibid.* at 1286-1287. Indeed the principal *Outer Space Treaty* negotiator for the US stated that the analogy of the high seas was a guiding theme during the drafting of article 1 of the OST establishing the freedom of outer space. Christol, *Modern International Law of Outer Space*, *supra* note 423 at 41. From this, Christol concludes that the negotiators of the OST were “aware of the *res communis* concepts applying to the ocean and were employing this analogy as they contemplated the legal rules to be applied in the exploration and use, including exploitation, of the space environment.” *Ibid.* at 45.

By contrast, Antarctica constitutes territory that could be likened to *terra nullius*.⁵⁵⁴ Previous to the 1959 Antarctic Treaty, several states laid claim to portions of Antarctica. This meant that for a period of time, those portions were no longer *terra nullius*. However, the Treaty's Parties, including all States that previously made territorial claims, "froze" all of those claims. The Parties also contracted that no new claims to sovereignty over any portion of Antarctica would be permitted – a situation strikingly similar to that established for the whole of outer space by Article 2 of the Outer Space Treaty.

Especially significant is the *dissimilarity* between the terms "peaceful purposes" as used in the Outer Space Treaty and that in the Antarctic Treaty. As used in the latter treaty, the phrase "peaceful purposes" specifically operates to create a demilitarized zone. Thus, Article 1 specifies that "Antarctica shall be used for peaceful purposes. There shall be prohibited, *inter alia*, any measures of a military nature, such as the establishment of military bases and fortifications, the carrying out of military maneuvers as well as the testing of any type of weapons."⁵⁵⁵ [emphasis added] Not only does this sweeping language rule out the possibility of "any" activity of a "military nature," but it clarifies the meaning of "peaceful purposes" as used in the Treaty.⁵⁵⁶ For the Antarctic Treaty, "peaceful purposes" functionally excludes virtually any military activity. Thus, by law Antarctica has become not only demilitarized, but weapons-free. Not so for outer space. Though the Outer Space Treaty does specifically restrict military activity in Article IV, it conspicuously omits the broad language modifying the phrase "peaceful purposes" as contained in the Antarctic Treaty. This use of the phrase in the Antarctic Treaty was undoubtedly evident to the drafters of the OST, and provides further, albeit indirect, evidence that "peaceful purposes" under the OST cannot simply mean "non-military."⁵⁵⁷

⁵⁵⁴ Regarding the principle of *terra nullius* and the example of Antarctica, see Malanczuk, *Introduction to International Law*, *supra* note 208 at 149.

⁵⁵⁵ *The Antarctic Treaty*, 1 December 1959, 402 U.N.T.S. 71 (entered into force 23 June 1961), reprinted in (1960) 54 A.J.I.L. 477 [hereinafter *Antarctic Treaty*].

⁵⁵⁶ Though the Treaty does permit the presence of military personnel, Article 1 ensures that the activity of such personnel will not be "of a military nature."

⁵⁵⁷ Although the *Antarctic Treaty* "has often been invoked as the most authoritative aid for the interpretation of the term 'peaceful' found in various outer space official texts," Vlasic, "Peaceful and Non-Peaceful Uses of Outer Space," *supra* note 419 at 41, the phrase cannot be divorced from the immediate context in which it is subsequently used. As noted previously; understanding of the term evolved from its early use in 1957 as applied to space activity through its final expression in the *Outer Space Treaty*.

Whether these two treaty regimes provide helpful analogies to outer space depends on the space activity contemplated. When applying the issue to military space combat, the high seas, though perhaps not necessarily the *legal regime* governing the high seas, appears a much better analogy than the territory of Antarctica. For example, while space affords tremendous tactical and strategic military advantage, Antarctica does not.⁵⁵⁸ Further, although Article 2 of the Outer Space Treaty prohibits claims of national appropriation and sovereignty in space, the OST also implies the legitimacy of weapons in space,⁵⁵⁹ a possibility the Antarctic Treaty forecloses⁵⁶⁰ for Antarctica, but the LOS Convention for the high seas does not.⁵⁶¹

B. United Nations General Assembly Resolutions

Of the four "phases" characterizing the development of space law according to Professor Malanczuk, the early United Nations General Assembly (U.N.G.A.) resolutions belong in the first.⁵⁶² Prior to the first space law treaty, UNGA resolutions articulated the emerging international consensus over basic principles to govern human activity in space. Even prior to the landmark 1963 "Legal Principles" Resolution, discussed below, the U.N.G.A. adopted Resolution 1721 on 20 December 1961. Among other things, this

⁵⁵⁸ Thus, "[t]hrough it is sometimes offered as a model for space, Antarctica has never offered military advantages that exceed the costs it imposes. . . . The arguments for many military uses of space, however, are cast in just such cost-effectiveness terms, making Antarctica, in that sense, not the analog but the inverse of space." W. Durch, "Introduction" in W. Durch, ed., *National Interests and the Military Use of Space*, *supra* note 54 at 7.

⁵⁵⁹ By explicitly prohibiting the orbiting of *nuclear* weapons and other weapons of mass destruction in Article 4, the OST implies that states remain free to orbit *non-nuclear* weapons that are *not* weapons of mass destruction.

⁵⁶⁰ Article 1, *supra* note 555 at 72. The military inefficiency of Antarctica likely accounts for the wide adherence to this provision of the treaty.

⁵⁶¹ Interestingly, the LOS Convention claims at Article 88 that the "high seas shall be reserved for peaceful purposes." As Professor Vlasic notes however, this "most certainly does not mean 'non-military,' given the well-known fact that the high seas are navigated by naval vessels of many nations and used for tests of nuclear missiles as well as for naval maneuvers. Hence, it is difficult to find the rationale for the inclusion of the reference to 'peaceful purposes' under the heading 'high seas' . . ." Vlasic, "Peaceful and Non-Peaceful Uses of Outer Space," *supra* note 419 at 41. If the term "peaceful" as used in the LOS Convention were given the meaning ascribed to the similar term in the OST by the majority of States, that is "non-aggressive," the comparison of outer space with the high seas for purpose of military use becomes all the more apt. While the high seas have been the location of military activity for centuries, outer space is becoming increasingly so. That both environments must be used for non-aggressive (peaceful) purposes does not impugn the current military uses, so long as they remain compliant with the *jus ad bellum*.

⁵⁶² Malanczuk, "Space Law," *supra* note 372 at 151. The other phases include: (2) the five major multilateral treaties; (3) the vigorous assertions of national and regional interests by developing countries;

resolution commended to States the proposition that international law applies to outer space, and that outer space is not subject to national appropriation by claim of sovereignty or otherwise.⁵⁶³ In the opinion of one eminent space law scholar, taken together with the "Legal Principles" Resolution, Resolution 1721 forms "the first chapter in the book of space law."⁵⁶⁴ This statement merits closer attention as the unquestioned importance of these resolutions may precipitate the conclusion that they constitute a formal source of international law.

The U.N. Charter invites the General Assembly to make "recommendations" on issues within its competence.⁵⁶⁵ Further, the seminal Article 38(1) of the Statute of the International Court of Justice articulates the three formal sources of international law, none of which include U.N. resolutions: (1) treaties; (2) international custom; and (3) general principles of law recognized by civilized nations.⁵⁶⁶ From this basis the consensus has emerged that U.N.G.A. resolutions do not in and of themselves bind States.⁵⁶⁷ Nonetheless, the space resolutions have proven significant to the formation of

and (4) the current phase characterized by tendencies toward privatization, commercialization, and national legislation. *Ibid.* at 151-154.

⁵⁶³ *International Co-operation in the Peaceful Uses of Outer Space* (3 January 1962) U.N. Doc. A/Res/1721 (XVI). The U.N.G.A. adoption Resolution 1721 unanimously. As noted by Cheng, "[l]egally and constitutionally, no special virtue attaches to an unanimous vote, even though politically it may be of significance." Cheng, "United Nations Resolutions," *supra* note 390 at 35.

⁵⁶⁴ Cheng, "United Nations Resolutions," *supra* note 390 at 23.

⁵⁶⁵ U.N. Charter, Article 10, *supra* note 351 at 8.

⁵⁶⁶ *Statute of the International Court of Justice*, Article 38, *supra* note 350 at 60-62.

⁵⁶⁷ A standard text on international law includes the following commentary on U.N.G.A. resolutions: "...General Assembly resolutions are not as such legally binding upon member or non-member States in the manner of legislation enacted by national parliaments. In terms of the sources listed in Article 38(1) [of the *Statute of the International Court of Justice*], although some writers have argued that General Assembly resolutions might be seen as informal treaties or as indicating general principles of law, the most common view ... is that they contribute in some way to the formation of custom. It is generally agreed by writers that General Assembly resolutions may serve as a convenient statement of a custom already established by state practice of the accepted kind (diplomatic notes, etc.), or may at once or gradually cause states to march in step in their practice so as to create one ... General Assembly resolutions may also contribute to custom more directly as a form of 'collective' State practice. They are the collective equivalent of unilateral general statements or, in the context of a particular dispute, '150 diplomatic protests.'" Harris, *supra* note 354 at 61. Following the adoption of Resolution 1721, the US delegate stated the following: "When a General Assembly resolution proclaimed principles of international law – as resolution 1721 (XVI) had done – and was adopted unanimously, it represented the law as generally accepted in the international community." Quoted in Cheng, "United Nations Resolutions," *supra* note 390 at 35. Key to this broad assertion is the word "represented." That is, the Resolution did not *become* customary law, it simply served as the vehicle by which the international community expressed unanimous agreement that the resolution's substance was *reflective* of the law. The US delegate's statement is "broad" in that it purported to give the U.N. principles the status of customary international law before any custom had developed. For the criticism of this assumption, see *supra* notes 390 through 392 and accompanying text. The assumption

space law. Indeed, as becomes evident below, such resolutions not only predated the subsequent space treaties, but have for a variety of reasons become the vehicle of choice for expressing international opinion on various space-related topics.⁵⁶⁸

1. Declaration of Legal Principles Governing State Activity in the Exploration and Use of Outer Space – 1963

The space resolution adopted in late 1963 by the United Nations General Assembly is of interest today largely for tracing the negotiating history of the Outer Space Treaty. Certainly a diplomatic breakthrough when it emerged from the bilateral US/Soviet negotiations, the “Declaration of Legal Principles”⁵⁶⁹ found itself incorporated almost entirely into the 1967 Outer Space Treaty.⁵⁷⁰ In many regards, it was the “first significant step in the development of space law.”⁵⁷¹

aside however, the statement recognizes that formally speaking, the U.N. resolution does not bind any State, whether expressing “legal principles” and adopted unanimously or not. As a 1975 US Department of State pronouncement stated: “As a broad statement of US policy in this regard, I think it is fair to state that General Assembly resolutions are regarded as recommendations to Member States of the United Nations. To the extent, which is exceptional, that such resolutions are meant to be declaratory of international law, are adopted with the support of all members, and are observed by the practice of states, such resolutions are evidence of customary international law on a particular subject matter.” Cited in Harris, *supra* note 354 at 62. [emphasis added] For further discussion of the legal significance of U.N.G.A. resolutions, see *infra* note 572.

⁵⁶⁸ This is likely a result of the increasingly fractious nature of international negotiation over space issues since of the 1979 *Moon Agreement*. The international governing organization called for by the *Moon Agreement* enshrined the interests of developing States not seen before in treaty law. To many of the more developed States, this “progress” came at the expense of their own economic and security interests. Thus, the absence of any new space treaties since 1979 is likely the result of failures in negotiation, as well as a genuine reticence by the more developed States against undertaking treaty obligations with which the State has little intention of complying or even incentive for entering.

⁵⁶⁹ *Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, 13 December 1963, G.A. Res. 1962 (XVIII), U.N. GAOR, 18th Sess. Supp. 15, U.N. Doc. A/5515 (1964) 15. It should be noted that though several of the U.N. Resolutions addressing outer space issues use the term “principles” in the title, these are not used in the same sense as the term appears in Article 38 of the *Statute of the International Court of Justice*. As articulated by the U.N.G.A., “principles” related to the use of outer space, remote sensing, or nuclear power sources in space are worthy precepts toward which States should aim in their use of outer space, but they are not “general principles of law recognized by civilized nations.”

⁵⁷⁰ In lockstep fashion, the *Outer Space Treaty* adopted the Resolution’s nine provisions practically word for word. Thus, Principle 1 became Article I, sentence 1 of the OST. Principle 2 calling for the free exploration and use of space in accord with international law became Article I, sentence 2. Principle 3 became Article II. Principle 4 on the applicability of international law to outer space became Article III. Principle 5, setting forth the novel requirement that States bear international responsibility for national activities in space became Article VI. Principle 6 became Article IX. Principle 7 became Article VIII. Principle 8 became Article VII. And Principle 9 became Article V.

⁵⁷¹ Jasentuliyana, “Developing Countries,” *supra* note 408 at 97.

The importance of the Resolution can be seen by the use of two terms in its title, "Declaration" and "Legal Principles." Because of the lengthy negotiating and drafting history predating the resolution, and its unanimous support, it practically amounted to a treaty when adopted. Though not binding on any State,⁵⁷² the Resolution does not read like a traditional resolution. Rather, it declares and announces legal principles instead of merely recommending a course of action. The considerable authority of its pronouncements were cemented in law just four years later with adoption of the Outer Space Treaty.

2. Principles Relating to Remote Sensing of the Earth from Outer Space – 1986

In contrast to the "Declaration of Legal Principles" of 1963, the 1986 Resolution on remote sensing activities addresses a specific form of outer space activity. The Resolution defines remote sensing as follows in Principle I: "the sensing of the Earth's surface from space by making use of the properties of electromagnetic waves emitted, reflected or diffracted by the sensed objects, for the purpose of improving natural resources management, land use and protection of the environment."⁵⁷³ Given the

⁵⁷² Though the Soviet Union wanted the substance of the Resolution incorporated into a legally binding instrument, it did not claim that the vehicle used, the U.N. resolution, achieved that end. The fact that a General Assembly Resolution assumes for itself the term "Declaration" does highlight the importance of the document. It does not however render the resolution "legally more binding than any other recommendation." Cheng, "United Nations Resolutions," *supra* note 390 at 31. As the United Nations Office of Legal Affairs has noted in a Memorandum on "Use of the Terms 'Declaration and Recommendation'": "3. In United Nations practice, a 'declaration' is a formal and solemn instrument, suitable for rare occasions when principles of great and lasting importance are being enunciated, such as the Declaration on Human Rights. A recommendation is less formal. 4. Apart from the distinction just indicated, there is probably no difference between a 'recommendation' or a 'declaration' in United Nations practice as far as strict legal principle is concerned. ... However, in view of the greater solemnity and significance of a 'declaration,' it may be considered to impart, on behalf of the organ adopting it, a strong expectation that Members of the international community will abide by it. Consequently, in so far as the expectation is gradually justified by State practice, a declaration may by custom become recognized as laying down rules binding upon States. ..." Quoted Cheng, *ibid.* Use of the word "may" in the last quoted sentence, means that the 'declaration,' by itself, cannot bind States. Nonetheless, some scholars speak in terms suggesting that Resolution 1962 is itself law. Thus, Judge Lachs, former Chairman of COPUOS concluded that "it is difficult to regard the 1963 Declaration as a mere recommendation: it was an instrument which has been accepted as law." M. Lachs, *The Law of Outer Space: An Experience in Contemporary Law-Making* (Amsterdam: A.W. Sijthoff, 1972) at 138.

⁵⁷³ *Principles Relating to Remote Sensing of the Earth from Space* 3 December 1986, GA Res. 41/65 (XLII), U.N. GAOR, 29th Sess., 95th Plen. Mtg., U.N. Doc. A/Res/41/65 (1987) [hereinafter *Remote Sensing Resolution*].

absence of any governing treaty,⁵⁷⁴ the Remote Sensing Resolution is the most authoritative international document to provide not only a general definition, but also the basic parameters of permissible State activity. Passed unanimously by the General Assembly, the Resolution was the culmination of previous efforts from 1968 through 1985.⁵⁷⁵ Although related to the activity of military reconnaissance satellites, the Remote Sensing Resolution aims rather at formulating norms for civilian and commercial users.⁵⁷⁶ Nonetheless, the biggest users of civil and commercial remote sensing data are the military and intelligence agencies.⁵⁷⁷ Thus, the Resolution could become relevant to

⁵⁷⁴ Though not specifically geared toward remote sensing, several provisions of the *Outer Space Treaty* could apply to remote sensing. These include Article I (equal use of space by all States), Article III (activities conducted in accord with international law in the interest of maintaining international peace and security), Article VI (States bear international responsibility for national activities), and Article XI (duty to inform U.N. Secretary General of space activities of member states "to the greatest extent feasible").

⁵⁷⁵ Christol, *Space Law: Past, Present and Future* (Deventer: Kluwer Law and Taxation Publishers, 1991) at 73 [hereinafter, Christol, *Space Law*]. After outlining the five general categories of compromise leading to agreement, Christol points out that the principle of "open skies" won the day. *Ibid.* at 76. He notes that in the end, even States initially hesitant to agree on freedom of surveillance from space "consulted self interest" and developed an expectation that the benefits to be gained by access to sensed data would outweigh any lost sovereignty to be suffered. *Ibid.* at 88.

⁵⁷⁶ Although the Resolution made no exception for military activities, this civil/commercial orientation can be seen from the Resolution's specific definition of "remote sensing" which aims at "improving natural resources management, land use and protection of the environment." Major civil and commercial applications for remote sensing data include: water resource management (surface water inventory, flood control mapping, irrigation demand estimation, water circulation, lake eutrophication survey, ground water location); forestry and rangeland management (forest inventory, clearcut assessment, habitat assessment, fire fuel potential); fish and wildlife management (habitat inventory, wetlands location, vegetation classification, snow pack mapping, salt exposure); land resource management (corridor analysis, facility siting, land cover inventory, flood plain delineation, solid waste management, lake shore management); environmental management (water quality assessment, coastal zone management, wetlands mapping, resource inventory, dredge and fill permits); agriculture (crop inventory, crop yield prediction, assessment of flood damage, disease monitoring); and geological mapping (lineament mapping, mineral surveys, powerplant siting, radioactive waste storage). U.S. Congress, Office of Technology Assessment, *Remote Sensing and the Private Sector* (March 1984) at 57. Some of these could easily be converted to military reconnaissance and surveillance purposes for locating targets, tracking fleet movements, identifying supply and transport facilities, monitoring air activities, and warning of enemy preparation or attack.

⁵⁷⁷ The following civil satellite systems produce data that is commercially-available to both private and public entities: KFA-1000 (Russia, 6 m resolution, 120 km swath); Radarsat (Canada, 8-30 m resolution, 55-550 km swath); ADEOS (Japan, 8-16 m resolution, 80 km swath); SPOT (France, 10-27 m resolution, 60-81 km swath); Landsat 6 (US, 15-120 m resolution, 185 km swath); JERS-1 (Japan, 18 m resolution, 100 km swath); CBERS (Brazil, 20 m resolution, 120 km swath); ERS-1 (European Space Agency, 15-30 m resolution, 80 km swath); RS-1 (India, 36-72 m resolution); MOS-1 (Japan, 50 m resolution). B. Preston, *Ploughshares and Power: The Military Use of Civil Space* (Washington, DC: National Defense University Press, 1994) at 29 [hereinafter Preston]. An update to include improvements since 1994 would swell this list as to the total number of systems, as well as technical capabilities. Today, imagery at 5 m resolution is generally available.

space warfare to the extent that a belligerent uses commercially available data in support of its military operations.⁵⁷⁸

Of the fifteen principles contained in the Resolution, the most important include the fourth, twelfth, and thirteenth. Principle IV specifically links remote sensing activities to Article I of the Outer Space Treaty, and encourages that remote sensing activities occur “on the basis of respect for the principle of full and permanent sovereignty of all States and peoples over their own wealth and natural resources ...”⁵⁷⁹ Widely viewed as a provision in favor of developing nations, this Principle further protects the “legitimate rights and interests of the sensed State.” The practical effect of these protections are unclear as the Resolution does not define several key terms, such as “legitimate.”

Central to the Resolution’s system of principles is the distinction between “primary data,”⁵⁸⁰ “processed data,”⁵⁸¹ and “analysed [sic] information.”⁵⁸² While the first two categories should be made available to a “sensed State,” the latter need not. Thus, Principle XII specifies that as soon as primary and processed data are produced, the sensed State will have “access” to such data on “a non-discriminatory basis and on reasonable cost terms.” While perhaps appearing to be a victory for the interests of sensed States, many of which are in the process of development and have no indigenous remote sensing capability, this “access” provision amounts to a victory for the liberty of the few States most active in space.⁵⁸³ Principle XII does not call on sensing States to offer prior notification to sensed States of its activities, and it certainly does not require

⁵⁷⁸ Preston makes the military connection to remote sensing clear: “From a traditional military view of national security, the obvious reason to worry about sensing from space is the ability of adversaries to exploit intelligence from remote-sensing information to achieve military advantage on the battlefield. A broader perspective on national security would include economic benefit and foreign policy advantage. For example, the Joint Chiefs of Staff basic national defense doctrine includes psychological or informational powers in its list of elements of national strategy. Remote sensing from space affects all of these: battlefield intelligence, economic strength, and diplomacy.” *Ibid.* at 25.

⁵⁷⁹ *Remote Sensing Resolution*, *supra* note 573.

⁵⁸⁰ Defined as “the raw data that are acquired by remote sensors borne by a space object and that are transmitted or delivered to the ground from space by telemetry in the form of electromagnetic signals, by photographic film, magnetic tape or any other means.” Principle I(b), *ibid.*

⁵⁸¹ “[T]he products resulting from the processing of the primary data, needed to make such data usable.” Principle I(c), *ibid.*

⁵⁸² “[T]he information resulting from the interpretation of processed data, inputs of data and knowledge from other sources.” Principle I(d), *ibid.*

prior permission for remote sensing from space – two issues creating lively debate as the State delegations negotiated the Resolution's final text.

Finally, Principle XIII exhorts sensing States, upon request, to "enter into consultations with a State whose territory is sensed in order to make available opportunities for participation and enhance the mutual benefits to be derived therefrom."⁵⁸⁴ Here the Principle assumes that the sensing is already occurring ("is sensed") before the consultations are to begin. Further, "consultations" is an unspecified term that appears not to bind States to much of anything in actual practice.⁵⁸⁵ Still, the provision is of some value as it encourages sensing States to reveal their activity to the sensed State. In cases where the sensed State would not otherwise know of the remote sensing activity over its territory, this appears to be a logical prerequisite for the sensed State to take advantage of access to the data encouraged under Principle XII.

As Professor Christol notes, though unanimity on the resolution was in some cases grudging, there have been no formal departures from the terms of the Resolution.⁵⁸⁶ As is

⁵⁸³ Arguably it is a victory for Article I of the *Outer Space Treaty* as well which requires that the use and exploration of outer space remain "free."

⁵⁸⁴ Principle XIII, *ibid.*

⁵⁸⁵ Again, as with all U.N. resolutions, language suggesting that States "shall" take action or "will" refrain therefrom does not *require* such action or *bind* such States. The mandatory, directive language used in the Remote Sensing Resolution (e.g., Principle II, "shall be carried out;" Principles III and IV, "shall be conducted;" Principle V and VIII, "shall promote international co-operation;" Principle VII, "shall make available technical assistance;" Principle IX, "shall inform the Secretary-General of the United Nations;" Principle X, "shall promote the protection of the Earth's natural environment;" Principle XI, "shall promote the protection of mankind from natural disasters;" Principle XII, "shall have access;" Principle XIII, "shall ... enter into consultations;" Principle XIV, "shall bear international responsibility;" and Principle XV, "disputes ... shall be resolved through ..."), as with other U.N. resolutions, is always subject to this clarification. To the extent that these provisions draw from the authority of international law, they simply reiterate a State's preexisting obligations.

⁵⁸⁶ Christol, *Space Law*, *supra* note 575 at 94. The author goes so far as to suggest that the Resolution's principles are representative of customary international law. After considering the fact that, despite the lack of thorough agreement, there is no overwhelming demand to overturn the principles or even reduce them to a treaty, Christol concluded in 1988 that "[f]or the moment the debate has been somewhat stilled. Even the best of agreements can become controversial or even unstuck. Perhaps the best long-term approach is to retain remote sensing on the agenda of COPUOS so that efforts can be made to transmit the terms of the Principles into a treaty. In this manner those who wish to dissent from the Principles can opt out. In considering this approach they may find that they may have no where to go. As has been abundantly indicated, *they will not find it easy to escape the norms of customary international law.*" *Ibid.* at 95 (emphasis added). Other commentators writing more recently have agreed. Thus, "[t]his resolution has come to represent a codification of customary legal principles that are binding on nations." J.I. Gabrynowicz, "Defining Data Availability for Commercial Remote Sensing Systems: Under United States Federal Law" (1998) XXIII Ann. Air & Space L. 93 at 95.

generally true for U.N. resolutions, the longer they are used as the international standard, the stronger their authority becomes.

3. Principles Relevant to the Use of Nuclear Power Sources in Outer Space – 1992

Beginning around the time of the 1978 crash of the Soviet Cosmos 954 satellite in Canada's Northwest Territories,⁵⁸⁷ COPUOS began working on an international technical framework for the regulation of nuclear power sources in space. Despite earlier resolutions touching on nuclear power,⁵⁸⁸ the project came to full fruition on 14 December 1992 with adoption by the U.N.G.A. of the "Principles Relating to the Use of Nuclear Power Sources in Outer Space."⁵⁸⁹ Because the NPS Resolution deals with the politically sensitive subject of nuclear power, its adoption is significant; this is particularly so given the specificity of its terms. To the extent that State practice consistent with the Resolution creates customary international law, the framework set forth could significantly affect space warfare – at least as to those nuclear power sources used in space warfare fitting within the scope of the Resolution.⁵⁹⁰

⁵⁸⁷ See *supra* notes 453 through 455 and accompanying text for a discussion of the Cosmos-954 incident.

⁵⁸⁸ Paragraph 9 of General Assembly resolution 33/16, dated 10 November 1978, requested that launching States "inform States concerned in the event that a space object with nuclear power sources on board is malfunctioning with a risk of re-entry of radio-active materials to earth." This subsequently became Principle 5 of the NPS Resolution. Further, paragraph 11 of General Assembly resolution 42/68, dated 2 December 1987, endorsed "the agreements reached in the Scientific and Technical Sub-Committee [of COPUOS] with respect to the use of nuclear power sources in outer space." As Terekhov notes, "[t]hose agreements were the recommendations formulated by the technical experts with the view to ensuring safe use of NPS in outer space, which recommendations had been subsequently reflected in the NPS [Resolution]." A.D. Terekhov, "U.N.G.A. Resolutions and Outer Space Law" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 97 at 101 [hereinafter Terekhov].

⁵⁸⁹ *Principles Relating to the Use of Nuclear Power Sources in Outer Space*, 14 December 1992, U.N. Doc. A/Res/47/68 [hereinafter *NPS Resolution*].

⁵⁹⁰ Because the *Outer Space Treaty* forbids the orbiting of "objects carrying nuclear weapons," the Resolution did not address the question of nuclear power sources in space used for weaponry. Although a strict exegesis of Article IV of the *Outer Space Treaty* reveals that what is prohibited by this clause is the orbiting of "objects carrying nuclear weapons" not "nuclear weapons" themselves, the subsequent clause – "or station such weapons in outer space in any other manner" – appears to foreclose the possibility of nuclear warheads in space. The obvious exception, undoubtedly heavy on the minds of *Outer Space Treaty* drafters during the course of negotiations, were the case of ICBMs capable of delivering nuclear warheads to terrestrial targets after transiting outer space for several minutes. Although such objects would put nuclear weapons or conceivably other weapons of mass destruction into space, such delivery systems would not constitute a placement "in orbit" or a "station[ing]" of such weapons in space, and would not therefore violate the *Outer Space Treaty*. See *supra* note 440. As used in the NPS Resolution, nuclear reactors in space applies neither to nuclear weapons (except those which might conceivably use nuclear power for

The NPS Resolution provides in the Preamble that its terms apply to "nuclear power sources in outer space devoted to the generation of electric power on board space objects for *non-propulsive purposes*."⁵⁹¹ Thus, any application to space weaponry that the Resolution may have relates only to those means of warfare using a nuclear power source to sustain electrical systems for the object.⁵⁹² Following this initial qualification, the Resolution's eleven Principles contain guidelines and criteria for safe use (Principle 3), safety assessments (Principle 4), and notification of re-entry (Principle 5). The Resolution also makes reference to the Outer Space Treaty in its assertions regarding State responsibility (Principle 8), and to the Liability Convention regarding State liability and compensation (Principle 9).

The heart of the Resolution is to be found in Principle 3. In establishing conditions for the "safe use" of nuclear power in space, it exhorts states to use NPSs only for missions "which cannot be operated by non-nuclear energy sources in a reasonable way."⁵⁹³ Thus, without defining "reasonable," the Resolution attempts to limit State use of NPSs while recognizing that for certain missions, such power sources are appropriate. Indeed the Resolution continues by establishing the three cases in which nuclear reactors may be used: (1) on interplanetary missions; (2) in "sufficiently high orbits";⁵⁹⁴ and (3) in low-earth orbits if they are stored in sufficiently high orbits after the operational part of their mission.⁵⁹⁵ Further, Principle 3 specifies that nuclear reactors for space missions

"generation of electric power") nor to nuclear power sources used for propulsion. *Infra* note 591 and accompanying text. Thus, it appears the law would allow the orbiting of nuclear power sources used for space weaponry. Such is not likely covered by the phrase "nuclear weapon" as used in the 1967 *Outer Space Treaty*, which more properly refers not to the weapon's method of propulsion, but to the nuclear source of its destructive power.

⁵⁹¹ *Ibid.*

⁵⁹² Though the Resolution does not cover nuclear propulsion, and is not legally binding in any event, there are other reasons it may not find widespread use as a prescriptive guide for military spacecraft. Collins notes that even though nuclear space propulsion has many proponents, it "attracts little official support and few funds, because it is costly compared with chemical systems, and powerful opponents (rightly or wrongly) fear it is unsafe. International political pressure to ban such engines is great." Collins, *supra* note 25 at 103.

⁵⁹³ *NPS Resolution*, Principle 3, *supra* note 589.

⁵⁹⁴ Defined as orbits "in which the orbital lifetime is long enough to allow for a sufficient decay of the fission products to approximate the activity of the actinides. The sufficiently high orbit must be such that the risks to existing and future outer space missions and of collision with other space objects are kept to a minimum." Principle 3(2)(b), *ibid.*

⁵⁹⁵ Principle 3(2)(a), *ibid.*

must only use enriched uranium 235 as fuel,⁵⁹⁶ and that design and construction of the nuclear reactor “shall ensure that it cannot become critical before reaching the operating orbit during all possible events.”⁵⁹⁷

Significantly, Principle 5 states what may well be a rule of customary international law: “Any State launching a space object with nuclear power sources on board shall in a timely fashion inform States concerned in the event this space object is malfunctioning with a risk of re-entry of radioactive materials to the earth.”⁵⁹⁸ This general statement would certainly affect space combat as to cases in which malfunctioning weapons, containing nuclear power sources, appear likely to reenter earth’s atmosphere and impact on foreign soil. The existence of an ongoing state of hostilities would render the duty to warn less certain as between the belligerents, though it would probably apply to dangerous, radioactive space objects likely to impact neutral States, even if pursuant to accidents occurring in military operations.

According to an unofficial report, States appear to be following the recommendations contained in the NPS Resolution.⁵⁹⁹ As an example, the Russian report

⁵⁹⁶ Principle 3(2)(c), *ibid.*

⁵⁹⁷ Principle 3(2)(e), *ibid.*

⁵⁹⁸ Principle 5(1), *ibid.* In the aftermath of the Cosmos 954 incident, *supra* notes 453 through 455 and accompanying text, the former Soviet Union disclaimed a duty to warn Canada of the impending crash, though it did in general recognize a duty to warn. Because its errant calculations revealed the satellite’s debris would either be incinerated on reentry, or land over the Aleutian Islands, the Soviet Union did notify the US prior to impact. In one of the diplomatic exchanges, the Soviets maintained that “[c]alculations made on the basis of [Cosmos 954’s] last orbits within the visibility range of our tracking facilities showed that if, because of the satellite’s emergency condition, individual parts of the satellite were not fully consumed in the atmosphere and reached the earth’s surface, they might fall into the open sea in the region of the Aleutian Islands. In this connection, the appropriate information was given to the U.S. government.” Quoted in Reynolds & Merges, *supra* note 21 at 181. Because Canada agreed that the Soviets had a duty to warn, this agreement on the basic norm – that the Soviet Union had a duty to warn – represents significant State *opinio juris* on one of the few cases involving the reentry of a space object carrying radioactive materials. Indeed, whether customary law or not, the Convention on Early Notification of a Nuclear Accident requires such notifications as contemplated in Principle 5 of the NPS Resolution. [Cite] This treaty, adopted soon after failure of the Soviet Chernobyl nuclear reactor, applies to “any nuclear reactor *wherever located*.” (Article 1(2), emphasis added) Thus, even for reactors located in space, the treaty mandates notification to other States Parties of accidents “from which a release of radioactive material occurs or is likely to occur and which has resulted or may result in an international transboundary release that could be of radiological safety significance for another State.” [Article 1(1), emphasis added].

⁵⁹⁹ Terekhov, *supra* note 588 at 101. Again, these U.N. principles are “recommendations” even though the NPS Resolution, as with the previous Remote Sensing Resolution, makes frequent use of “shall” in its attempt to encourage State behavior. The distinction between a resolution’s use of “shall” and its use of “should” matters little and does not affect the document’s non-binding character. “[T]he fact that, for example, the [Remote Sensing Resolution] contain[s] ‘shall’ and the [Benefits Resolution, see *infra* note 602 and accompanying text] uses mostly ‘should’ is not perceived as an indication that the former makes

to the U.N. Secretary General of its anticipated launch of the Mars 96 satellite powered by Plutonium-238 is cited.⁶⁰⁰ When the satellite malfunctioned and reentered the atmosphere, the Russians made notification of that event as well, in accord with Principle 5. Similarly, the US notified the Secretary General of its launch of the Cassini space probe, containing about 35 Kg of plutonium-238 dioxide.⁶⁰¹ These instances of “compliance” are important. To the extent that spacefaring States behave in accord with the U.N. Resolution as though doing so represents a legal norm, the behavior will slowly come to *be* a legal norm in the form of customary international law – if it isn’t already.

4. Declaration of International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interests of All States, Taking into Particular Account the Needs of Developing Countries – 1996

The so-called “Benefits Resolution,”⁶⁰² adopted in late 1996, is an attempt to elaborate that part of the Outer Space Treaty requiring that the exploration and use of outer space “be carried out for the benefit and in the interests of all countries.”⁶⁰³ How military space activity can be of benefit to *all* countries has been a matter of some debate. One commentator suggests that “the answer may be found in the issue of the equality of States (and by implication, in the prohibition of discrimination).”⁶⁰⁴ There is in the view of some however, “no obligation by States Parties to confine themselves ‘to activities in outer space exclusively to the benefit of all countries.’”⁶⁰⁵ This suggests that the benefit to all countries need not provide an equal, or even simultaneous benefit. The Benefits Resolution sought but failed to bring some clarity to this debate.

The Resolution recommends, *inter alia*, that contractual terms in cooperative space ventures be fair, reasonable, and “in full compliance with the legitimate rights and

stronger recommendations than the latter. In view of the foregoing, it appears that the “shall/should” controversy has basically lost its relevance at least as far as outer space declarations are concerned.” *Ibid.* at 102.

⁶⁰⁰ *Ibid.* at 101.

⁶⁰¹ See for example, “Is Cassini Risky? Look to Facts, Not Emotion” *AW&ST* 147:13 (29 September 1997) 66.

⁶⁰² *Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interests of All States, Taking Into Particular Account the Needs of Developing Countries*, 13 December 1996, U.N. Doc. A/Res/51/122.

⁶⁰³ *Outer Space Treaty*, Article I, *supra* note 405, 610 U.N.T.S. at 207.

⁶⁰⁴ Hurwitz, *supra* note 378 at 56.

⁶⁰⁵ *Ibid.* (quoting D. Goedhuis, “Legal Aspects of the Utilization of Outer Space” (1970) 17 N.I.L.R. 27 [emphasis added by Hurwitz]).

interests of the parties concerned" (paragraph 2); that spacefaring nations "contribute to promoting and fostering international cooperation on an equitable and mutually acceptable basis" (paragraph 3); and that international cooperation aim at promoting "the development of space science," "the development of relevant and appropriate space capabilities," and "exchange of expertise and technology among States on a mutually acceptable basis" (paragraph 5).

While the Benefits Resolution says nothing at all even remotely applicable to space warfare, it seems to contain little of value even about the very clause on which it intended to expand. If the Resolution establishes the international consensus on the meaning of use and exploration of space "for the benefit and in the interests of all countries,"⁶⁰⁶ then the phrase from the OST means little indeed. In sum, the Resolution adds nothing new to assist States in the understanding of their obligations under international space law.

C. International Telecommunication Union

The growth of the telecommunications industry predates the space age. Nonetheless, since the advent of satellite telecommunications the industry's rate of growth has increased tremendously. The International Telecommunication Union (ITU), through its Radio Regulations Board (RRB) governs the international use of the radio spectrum.⁶⁰⁷ As a limited natural resource, the spectrum will support only a finite number of users among the radio frequencies before signal interference begins to occur. As a result, a coordinated global effort to deconflict use of the spectrum becomes the *sine qua non* of the world-wide telecommunications capability. The RRB is the forum for such coordination and its radio regulations specify with great detail the international standards for coordinating use of radio frequencies.

As suggested above, the US military maintains its own military satellite telecommunications network.⁶⁰⁸ However, because of the potential for interference, it must pay careful attention to the regulations issued by the ITU in order to avoid harmful signal interference. Although not applicable to the military or other "national security"

⁶⁰⁶ The Resolution was adopted without vote making it difficult to gauge the support it garnered.

⁶⁰⁷ Wilson, *supra* note 31 at 249.

⁶⁰⁸ *Supra* note 113.

functions,⁶⁰⁹ the ITU regulations govern the majority of telecommunications systems in space. During military operations, and especially during armed conflict, the military must operate its telecommunication networks, or lease the capability from civilian providers, so as to avoid radio interference. This obligation comes not as the result of legal mandate, but military necessity. Because armed forces heavily rely on telecommunications for efficient command and control,⁶¹⁰ including commercially operated telecommunications systems,⁶¹¹ their use of the radio spectrum must be done taking into account other users with the potential for harmful interference. Failing to do so risks losing the critical ability to communicate. Armed conflict creates numerous unforeseen challenges for military forces; these have been termed the “friction” of war.⁶¹² Interference-free communications provides one of the best lubricants against that friction, and therefore becomes an indispensable component in the successful prosecution of war.

⁶⁰⁹ “Members retain their entire freedom with regard to military radio installations.” *Constitution of the International Telecommunication Union*, Article 48(1), 22 December 1992 (as amended through 1994), online: International Telecommunication Union Homepage <http://www2.itu.int/itudocs/gs/consconv/47136_ww6.doc> (date accessed: 3 July 1999). Because the RRB regulations do not regulate military activity either in peacetime or war, they cannot be classified as part of the *jus in bello*. Nonetheless, because they govern the civil and commercial use of radio spectrum, they become a critical factor in establishing a military telecommunications capacity in support of armed conflict. Beyond this however Article 48(2) requires “so far as possible” that military radio installations “observe statutory provisions relative to giving assistance in case of distress and to the measures to be taken to prevent harmful interference, and the provisions of the Administrative Regulations concerning the types of emission and the frequencies to be used, according to the nature of the service performed by such installations.” *Ibid.*

⁶¹⁰ During one point toward the end of the 1991 Persian Gulf War, the US DSCS system was providing 75 percent of all inter- and intratheater multichannel trunking. Leased commercial satellites provided 20 to 25 percent of all satellite communications used by US forces. See Preston, *supra* note 577 at 131-132. The Commander in Chief of USSPACECOM later testified before the US Congress, “Effective command and control of U.S. and coalition forces simply would have been impossible without military satellite communication systems. Over ninety percent of the communications to and from the area of operations were carried over satellite systems.” *Ibid.* at 133.

⁶¹¹ The effects of losing commercial telecommunications services were dramatically illustrated for participants of the 1999 US “Army-After-Next Space and Missile Defense” wargame. When the “Blue” forces lost information superiority as a result of degraded commercial space services, participants witnessed a “drastic impact on combat capabilities. ... Regional commanders found they had to compete with other paying customers for commercial space services, such as communications. Ideal time slots and capacities were not always available.” P. Proctor, ed., “Wargame Wake-Up Call” *AW&ST* 150:14 (5 April 1999) 17.

⁶¹² Clausewitz, *supra* note 205.

Chapter Six: The Law of war in Outer Space

[The humanitarian law of armed conflict] applies to all forms of warfare and to all kinds of weapons, those of the past, those of the present and those of the future.⁶¹³

International Court of Justice (1996)

A review of current scholarship analyzing the application of the law of war to outer space warfare yields little information. While many authors have written on space militarization and weaponization, and some on space warfare, almost none have undertaken an analysis of space warfare in the context of the law of war.⁶¹⁴ Indeed, it would seem that popular culture in the form of science fiction movies has taken a greater interest in the subject than have legal scholars and practitioners.⁶¹⁵ For at least two

⁶¹³ *Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons*, *supra* note 198 at para. 86. In this important opinion, the Court cites several of the numerous statements advanced by States for the conclusion that the law of armed conflict applies to nuclear weapons whether nuclear weapons were in existence at the time the law developed or not. Two important points arise from this discussion. First, as the Court quotes from the representative statements of States, the following phrases are used and are assumed by the court to be synonymous: "international humanitarian law" (New Zealand), "rules applicable to armed conflict" (Russian Federation), "*jus in bello*" (United Kingdom), and "law of armed conflict" (United States). Second, as the quote above makes clear, the court's conclusion that humanitarian law applies to nuclear weapons is equally applicable to any "past . . . present and . . . future" forms of warfare and kinds of weapons. If true, this statement certainly answers the question of whether the law of war will apply to space warfare.

⁶¹⁴ While the author is aware of one paper presented at a Princeton symposium in May 1999 by Professor M. Bourbonniere, with one exception he is aware of no other authors in print on the specific topic under review. That exception, dating to 1959, presciently outlined several themes related to the regulation of space warfare from the relative infancy of military space development in the 1950s. J.G. Verplaetse, "The Law of War and Neutrality in Outer Space" (1959) 29 *Nordisk Tidsskrift for International Ret* 49. The author pointed out that "[t]he unknown cannot be regulated, even less juridically organized." *Ibid*. Somewhat surprisingly, 40 years after the appearance of this article, the regulation of means and methods of space warfare still appears to be largely unknown. Verplaetse's prediction about the possibility of armed conflict in space remains as true today as ever: "Human forecast cannot but accept the likelihood that Outer space will soon be part of the theater of war of terrestrial belligerents." *Ibid*. at 51.

⁶¹⁵ In the 1999 Hollywood production *Star Trek Insurrection*, one scene has Chief Engineer Lt Geordi LaForge responding to a weapon's explosive impact with his spaceship as follows: "I thought subspace weapons were outlawed by the Khitomer Accords?" "They were," comes his crewmate's ominous reply thereby identifying a violation of the 24th Century law of war. Professors Scharf and Robert have written a fascinating article advocating the use of literature and television, particularly the television series "Star Trek: The Next Generation," as pedagogical aids for the teaching of international law. The authors identify nineteen issues, over the seven-year, 175 episode life of the popular television series in which principles of international law emerge. Of these, ranging from the principle of *jus cogens* to interstellar environmental law, the category "war crimes" bears direct relationship to the law of war. In one episode from 1992, "I, Borg," the authors point out a scene in which the principal characters contemplate returning one of the bio-mechanical Borg POWs to his ship, having been infected with a computer virus that would poison his entire race. This provokes the following statement from the ship's physician, Dr. Beverly Crusher, "even in war there are rules; you don't just kill civilians indiscriminately." M.P. Scharf & L.D. Robert, "The Interstellar

reasons, this must change. First, use of the space environment in warfare is not just a matter of speculative planning for future conflicts, it has already occurred. As the wars in the Persian Gulf and Yugoslavia made clear, space assets were decisive in battle planning and execution. Second, failure to analyze one's legal obligations raises the very real specter of violating obligations that do in fact exist. Given that the US military contemplates armed conflict within the space environment, it must not proceed oblivious to norms establishing permissible and impermissible means and methods of warfare. For example, the increasing use of high-tech wargames using space combat scenarios is uncovering knotty legal issues. It is also giving added urgency to questions that become increasingly "real world" such as the following: "[d]oes intentional interference with a U.S.-owned satellite orbiting 600 mi. above the Earth constitute an act of war?"⁶¹⁶

Relations of the Federation: International Law and 'Star Trek: The Next Generation'" (1994) 25 U. Tol. L. Rev. 604. (Given the specific race at issue, the assimilation-oriented, genocidal "Borg" in which each "individual" member fully participates in the objectives of the "collective," one wonders whether any would qualify as a "civilian" under the law of war.) These examples are somewhat related to currently foreseeable space warfare, however their context simply assumes the legitimacy of such warfare without exploring lawful methods and means. What law of war scenarios the series did portray were fairly simplistic applications of permissible treatment of POWs. Thus, interesting though these instances may be, they provide no greater clarity on the subject here at issue than does the relative silence from the scholarly community. Beyond these specific references, a review of the following recent Hollywood releases shows the general popularity of space and science-fiction themes at the box office: Apollo 13, Independence Day, Armageddon, Deep Impact, Contact, Lost in Space, My Favorite Martian, Wing Commander, the Star Wars remake, and a total of eight Star Trek movies. The increasing popularity of these movies may account for the lack of scholarly legal analysis as commentators find it difficult to take seriously what the popular mind delegates to the category "science fiction."

⁶¹⁶ Indeed, even beyond wargame scenarios, events prompting questions such as this have already occurred. One author has reported electronic interference by a hostile Middle East power against a US military satellite. "In one recent case the interference continued for weeks. When the U.S. satellite changed to a different channel, the interference also changed channels, suggesting a deliberate attempt by a Third World country to jam a U.S. military communications satellite. The potential of radio interference is especially significant considering that the United States is dependent on satellites for 75 percent of its long-distance military communications." Hackett & Ranger, "Proliferating Satellites Drive U.S. ASAT Need" *Signal* (May 1990) 156. While cases such as this arguably do not rise to the level of an "armed attack" justifying the use of armed force in self defense under the *U.N. Charter* (see *supra* notes 351, 356, and accompanying text), they do raise questions about the legitimacy of coercive responses short of armed conflict, and whether non-aggressive military action could or should be interpreted as a threat or use of force under Article 2(4). For an insightful analysis of the analogous problem of computer network attacks under the *jus ad bellum*, see Schmitt, *infra* note 696. Beyond this, the 1997 "Army After Next" wargame "jolted military and civilian leaders by showing that if U.S. satellites are quickly destroyed in the early stages of a conflict, ground forces can rapidly grind to a halt." W.B. Scott, "Wargames Revival Breaks New Ground" *AW&ST* 149:18 (2 November 1998) 56, 58. To be effective, wargames require clear rules specifying what players can and cannot do. To the extent space wargaming continues raising questions to which there are no clear answers, such as application of the law of war and the *jus ad bellum*, these scenarios have served a useful purpose in prompting the development of national policy. However, with respect to law of war principles, the games often reveal a shortcoming beyond the control of the US military or government: an inability to

Given the numerous previous uses of space assets for combat support, the evolution from passive, defensive support systems to active, offensive, weaponized systems seems only a matter of time. Professor Spires provides the following instructive review of space assets used in combat:

As early as the Vietnam conflict, weather and communications satellites furnished useful data and imagery to commanders in Southeast Asia and linked them with Washington, D.C. More recently, satellite communications had proven important in the British Falkland Islands campaign and in Urgent Fury, the Grenada invasion of 1983. In 1986, during Operation Eldorado Canyon, space systems provided a vital communications link and supplied important mission planning data to aircrews that bombed targets in Libya. In 1988, Operation Earnest Will witnessed the first use of GPS test satellites to support ships and helicopters during mine sweeping operations in the Persian Gulf. During Operation Just Cause in Panama in 1989, DSCS satellites provided long-haul communications links and DMSP supplied important weather data.

These operations, however, involved only portions of the military space community for a relatively brief period of time, and the contribution of space systems was not widely understood or appreciated. Desert Storm, by contrast, involved the full arsenal of military space systems. Nearly sixty military and civilian satellites influenced the course of the war ...⁶¹⁷

To these military uses can be added the extensive use of space assets in the 1999 Operation Allied Force campaign in Yugoslavia.⁶¹⁸ What this review demonstrates is that the military use of space for combat continues toward more robust, integrated systems. The increasing reliance on space assets strongly suggests that the space environment will eventually become a distinct theater of military operations.⁶¹⁹

ensure that the development of international law will account for anticipated military capabilities. On the possible role law of war manuals might play in remedying this shortcoming, see *infra* note 683 and accompanying text.

⁶¹⁷ Spires, *supra* note 56 at 244-245.

⁶¹⁸ See *supra* note 9.

⁶¹⁹ While recognizing the tremendous qualitative difference between the use of space in support of combat operations, and the weaponization of space itself, the author believes it virtually assured that within the near future space will be widely viewed as its own military theater of operations and thereafter weaponized. Increasing awareness in the US of the need to protect national space assets continues to drive the debate closer toward weaponization. Though space weapons will likely be developed with the principal purpose to defend satellites, some will undoubtedly be fielded to provide for an "offensive" counter-attack. In both cases, the strategic and political implications appear to be the same. As Colin Gray points out, it "is a distinction without a difference." Gray, *supra* note 654 at 49. Gray proceeds to articulate four strategic reasons why the US should weaponize space. Though written before the breakup of the Soviet Union, and largely directed toward a Soviet adversary, the continuing Russian threat coupled with the evolution of new

A. Bases on Which the Law of war Applies to Outer Space

To those familiar with international law, it may seem strange to undertake a separate discussion of the bases on which the law of war applies to outer space conflicts. As a general proposition of international law, the obligation of States are not conditioned on geography unless otherwise specifically noted or unless the circumstances of the obligation make such conditions obvious. As a result, it may appear self-evident that the law of war will apply, to the extent it has relevance, to future space conflicts.⁶²⁰ But this is not necessarily accurate for the simple reason that the specific legal norms governing space warfare, with very few exceptions,⁶²¹ have yet to emerge. Thus to provide the basis for further development, the conclusion that the principles of the law of war apply to outer space should prevail only on the basis of reasoned legal argumentation. At least three methods of argument appear to sustain the conclusion that the existing laws of war do apply, to space warfare: argumentation by analogy, argumentation based on specific reference to the terms of the Outer Space Treaty, and argumentation based on the Martens' clause.

1. Analogy

As discussed earlier, development of the *corpus juris spatialis* has occurred in part by use of legal analogies.⁶²² Analogy has been used in two senses. First, the environment to be regulated – outer space – is compared to other environments, such as the high seas

space powers, could make Gray's points equally compelling today: first, both the US and Soviet Union (now Russia) use space for military purposes that would be critically important during war; second, passive defensive techniques, or survival aids short of weaponization, are not certain to succeed; third, the Soviet Union likely already has deployed ASATs; and fourth, it is unlikely that US spacecraft can be protected through deterrence given that the Soviets have too much to gain by attacking them in war. *Ibid.* at 49-51. "Overall, these arguments amount to the following policy judgment: US self-denial of ASAT capability will not contribute to the survival prospects of US C3I assets in space – indeed, quite the opposite is true. Such self-denial could, and most probably would, permit the Soviet Union [or other potential future space adversary] to gather and relay strategic intelligence fatal to the validity of the US policy of continuing deterrence." *Ibid.* at 51.

⁶²⁰ Professor Cheng hints that such is the case in his syllogistic argument for the proposition that the legal regime for outer space is analogous to the basis status of the high seas. His major premise, "that international law is inherently applicable to outer space," would certainly include the law of war. B. Cheng, "Astronauts" in *EPIL*, vol. 11, *supra* note 29 at 40.

⁶²¹ As discussed previously, these include restrictions on the orbiting of nuclear weapons or other weapons of mass destruction under Article IV of the OST, as well as the detonation of nuclear weapons in outer space under the Limited Test Ban Treaty.

⁶²² *Supra* notes 551 through 561 and accompanying text.

and Antarctica. On this basis, the legal regime governing outer space has been developed drawing from legal norms governing these other environments. Second, the use of analogy occurs after a legal norm within the *corpus juris spatialis* has already been established. In this sense a principle of law is interpreted by means of analogy with a specific principle from another legal regime. This could be termed argumentation by micro-analogy, while the other constitutes argumentation by macro-analogy.

Both types of argumentation will be useful with respect to developing a *jus in bello* for space. On the macro-level, the *jus in bello* governing means and methods of combat on land, sea, or air, provides potential similarities to means and methods of space combat made possible by the existing and proposed technologies discussed in Chapter Two. The closer the factual similarity, the more likely it is that the existing norm will undergird the developing legal regime for space. Similarly, given the relative youth of space law, argumentation by micro-analogy is just about the only means of interpreting the general *corpus juris spatialis* to fit specific legal issues relating to the military use of outer space. Though use of analogies in any sense can be misleading if it amounts to misrepresentation of the existing norm used as the analogy, it will undoubtedly guide the quest for articulating the current *jus in bello* for space, as well as the development of the many further norms likely to emerge in the context of State practice.⁶²³

a. Parallels to Sea Warfare

Given the general jurisdictional parallels and legal analogies drawn between outer space and the high seas,⁶²⁴ a similar comparative approach is natural in attempting to establish the status of outer space in conditions of armed conflict. The sovereign rights of all States on the high seas are equal. So too in outer space. Once armed conflict has begun however, with the exception of avoiding the territory and property of neutral

⁶²³ As implied throughout this thesis the *jus in bello* for space demonstrates an "already/not yet" character. Legal commentators understandably seem reluctant to speak of an existing and distinct *jus in bello spatialis* ("not yet"), though as has been shown in Chapters Three through Five above, numerous specific customary and conventional norms operate to limit means and methods of space warfare that States may lawfully employ ("already").

⁶²⁴ For example, the U.N. Convention on the Law of the Sea distinguishes between territorial sea (complete State sovereignty and jurisdiction) and high seas (no State sovereignty or jurisdiction, except jurisdiction over its registered vessels). Similarly, above the earth States recognize the distinction between national

States,⁶²⁵ the legal status of the place in which combat occurs becomes less important. Thus, if State A launches an "armed attack" against State B, the latter may respond in self-defense either in State A's territory, State B's territory, the high seas, international airspace, or outer space. As a result, though space law has made significant use of analogies from the law of the sea, a unique analogy between warfare in space and warfare on the high seas appears inapposite, at least as distinguished from analogies with international airspace and the territory of opposing belligerents.

b. Previous Application of the Law of War to Aerial Warfare

In addition to the use of analogies drawn by the *corpus juris spatialis* from the law of the sea, it is likely that the *jus in bello* for space will draw on the developmental patterns characterizing evolution of the *jus in bello* for aerial warfare.⁶²⁶ When the Hague conferences met in 1907, aviation was a fledgling industry. There were profound uncertainties about how or even if aviation could be effectively used in war. Thus, the 1907 conventions do not specifically address limits on aerial warfare.⁶²⁷ As aeronautical technology developed, the international community never adopted a single document creating a binding legal regime restricting means and methods of aerial warfare. Though the 1923 Hague Rules of Aerial Warfare are thought to reflect customary law in some respects, not a single nation ever ratified this agreement. What does exist by way of restriction, exists in piecemeal form through an array of instruments comprising the laws

airspace (complete State sovereignty and jurisdiction) and outer space (no State sovereignty or jurisdiction, except jurisdiction over its registered objects).

⁶²⁵ "As a general rule, neutral territory is treated as sacred space; it is inviolable." J. Astley & M.N. Schmitt, "The Law of the Sea and Naval Operations" (1997) 42 A.F.L.R. 119 at 140. The law of neutrality is a part of the law of war but not of the *jus in bello* and is largely consistent with the law of the sea. Thus, the maritime rights and duties of States in peacetime continue to exist for the most part during armed conflict. See *ibid.* at 138.

⁶²⁶ At the risk of descending into logical abstraction, a further clarification is necessary. With reference to the macro/micro categories established above, the form of argumentation here amounts to a *meta*-macro-analogy. That is, not only are we in this case comparing one combat environment to another to conceive a suitable legal framework for war, we are examining the *development* of that comparison as it has been used to establish the newer framework for aerial combat. Thus, the suggestion made here as to the evolution of norms limiting aerial warfare depends not only on the comparison of entire legal systems (macro-analogy between aerial combat and land/sea combat) within international law, but on an analysis of the larger (meta) process by which the comparison led to the newer legal regime in the first place.

⁶²⁷ The possible exception being the proscription on discharging projectiles from balloons found in the *Declaration (XIV) Prohibiting the Discharge of Projectiles and Explosives from Balloons*, 18 October 1907, reprinted in Schindler & Toman, *supra* note 198 at 202.

of war. This evolutionary, piecemeal approach to restrictions on aerial warfare is likely to characterize the evolutionary growth of international restrictions on space warfare as well.

Military roles and missions for space assets in the US have developed along lines similar to those of airpower during the beginning of this century.⁶²⁸ In both cases, intelligence-gathering and support operations came first, followed by each respective medium used as a means of transportation. Finally, offensive and defensive combat roles followed. As USSPACECOM plans for offensive and defensive combat capabilities in space, the comparison with airpower appears complete. Of course, the possibility always exists that space combat will be outlawed by international agreement. However, "the odds are poor. ... Deep-seated [human] traits create tremendous temptations for aggressors to take all, unless probable costs of such action exceed anticipated gains."⁶²⁹

As a result of the parallel development of air and space military missions, and of the piecemeal recognition of international limits on means and methods for prosecuting aerial war, it is reasonable to predict that the *jus in bello* for outer space will evolve as did the *jus in bello* for airspace: incrementally, by analogy to former means and methods of warfare, and in the absence of a comprehensive treaty-based system of prohibitions.

2. Outer Space Treaty

Article III of the Outer Space Treaty provides perhaps the clearest indication that the international law of war will apply to space warfare:

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 co-operation and understanding.⁶³⁰

Two significant observations arise from this provision. First, Article III applies the restrictions of all international law to outer space activities ("in accordance with"). As products of "international law," this surely includes both the *jus ad bellum*, made

⁶²⁸ Cited in Collins, *supra* note 25 at 1, n.2.

⁶²⁹ *Ibid.* at 2.

⁶³⁰ *Outer Space Treaty*, Article III, *supra* note 405, 610 U.N.T.S. at 208. In addition, the OST references international law as well at Article I: "Outer space, including the moon and other celestial bodies, shall be

obvious by Article III's specific reference to the U.N. Charter, and the *jus in bello*. This observation provides the strongest evidence that as far as its principles will apply to future technologies, the law of war has been incorporated into military space operations by virtue of the OST.

A second observation relates to the requirement that a State's exploration and use of outer space be "in the interest of maintaining international peace and security." This well-worn phrase in international law comes directly from, among others, the U.N. Charter.⁶³¹ As historically used, the phrase assumes that military force will be available to the international community to ensure international order.⁶³² As international law has limited the means and methods States may use in employing military force in combat, those limits form a part of the context in which the maintenance of international peace and security, including the use of force in space, must occur.

3. Martens' Clause

A final observation regarding the application of the laws of war to military space operations relates to what became known at the Hague diplomatic conferences as the "Martens' Clause." This clause, so named for the Russian delegate proposing its inclusion, was inserted into the preamble of the 1899 second convention and the 1907 fourth convention. The clause was intended to supplement the prohibitory rules adopted at both conferences. The clause appears in several law of war documents, and reads as follows in its 1907 iteration:

Until a more complete code of the laws of war has been issued, the high contracting parties deem it expedient to declare that, in cases not included in the Regulations adopted by them, the inhabitants and the belligerents remain under the protection and the rule of the principles of the law of nations, as they result from the usages established among civilized peoples, from the laws of humanity, and the dictates of the public conscience.⁶³³

free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law." *Ibid.* at 207-208.

⁶³¹ Article 1(1), *supra* note 351 at 4. The phrase appeared previously in the Covenant of the League of Nations.

⁶³² That is, it requires the "activity which is necessary for maintaining the conditions of peace." R. Wolfrum, "Article 1" in B. Simma, et al., eds., *The Charter of the United Nations: A Commentary* (Oxford UK: Oxford University Press, 1994) at 50.

⁶³³ Preamble, paragraph 8, reprinted in Roberts & Guelff, *supra* note 209 at 45.

The clause reminds States Parties that explicit prohibitions within the Treaty do not supercede general, implicit prohibitions operating in the background by way of "principles of the law of nations." In this way, the clause covers not only customary international law but also incorporates all rules and principles of the general law of nations.⁶³⁴ As a result, it does more than simply claim that customary international law fills in the gaps left by conventional law.

The further influence of the clause can be seen by its inclusion into successive law of war documents throughout the twentieth century. Thus, versions of the principle quoted above have appeared in each of the four 1949 Geneva Conventions,⁶³⁵ the 1977 protocol (I) to the Geneva Conventions governing international armed conflicts,⁶³⁶ and the 1980 convention on conventional weapons.⁶³⁷ This widespread incorporation of the principle, adopted by the vast majority of states, strongly suggests that the Martens' Clause itself may have become a principle of customary international law.⁶³⁸

The continuing vitality of the doctrine expressed in the Martens' Clause will be particularly important for space warfare, often thought to be the most technologically innovative form of warfare. Because the doctrine is phrased "dynamically,"⁶³⁹ implicitly anticipating the need to regulate means and methods of warfare developed through technological advances, it will always operate to limit the lawful prosecution of space warfare. No matter what new means or methods are developed, they will remain subject to "the principles of international law derived from established custom, from the principles of humanity and from the dictates of public conscience."⁶⁴⁰

⁶³⁴ The distinction between customary law and other general principles of law was later announced as comprising two separate sources of international law. See Article 38, *Statute of the International Court of Justice*, *supra* note 350.

⁶³⁵ Convention I: article 63, paragraph 4, Roberts & Guelff, *supra* note 209 at 192; Convention II: article 62, paragraph 4, *ibid.* at 213; Convention III: article 142, paragraph 4, *ibid.* at 270; Convention IV: article 158, paragraph 4, *ibid.* at 325.

⁶³⁶ Article 1(2), *ibid.* at 390.

⁶³⁷ Preamble, paragraph 5, *ibid.* at 473.

⁶³⁸ This possibility is strengthened by the claim of the International Military Tribunal at Nuremberg in 1946 that convention IV is declaratory of customary international law. Roberts & Guelff, *supra* note 209 at 44.

⁶³⁹ H. Strebel, "Martens' Clause" in EPIL, vol. 3, *supra* note 29 at 252.

⁶⁴⁰ Taken from the 1977 Protocol (I) to the 1949 Geneva Conventions, article 1(2). Roberts & Guelff, *supra* note 209 at 390.

B. Problems of Legal Definition and the Use of Force in Space

As is the case with domestic law, international law depends for its coherence and consistency on clear definitions of key terms. The quest to further develop a *jus in bello* for space will be plagued with the conspicuous absence of authoritative definitions of several significant terms and concepts. In addition to the difficulty of applying existing law, this situation holds important lessons for the future drafting of space treaties, including the importance of avoiding terms and phrases open to more than one reasonable interpretation.⁶⁴¹ Though the lack of definition or use of ambiguous terms often reflects the presence of irreconcilable difference among the drafters, such devices can work to utterly frustrate the aims of the treaties in which they appear. It certainly will complicate the emergence of a distinct *jus in bello* for space.

1. Militarization of Space

As noted previously, the militarization of outer space does not necessarily entail its weaponization.⁶⁴² Many of the legal issues arising from the militarization of space do so in part because of the absence of clear definitions for terms used in the relevant space treaties. For example, aside from "peaceful purposes"⁶⁴³ and "outer space,"⁶⁴⁴ the law lacks basic authoritative definitions of other terms including "space object," and "space

⁶⁴¹ Vlasic, "Negotiating and Drafting Agreements Relating to Outer Space," *supra* note 410 at 209.

⁶⁴² See definitions of "militarization" and "weaponization," *supra* note 52.

⁶⁴³ As suggested above, the common view today regards "peaceful purposes" as synonymous with "non-aggressive." Such operations would include not only peacetime military activity, but also activity involving the use of force during armed conflict. What makes an activity "aggressive" and thus "non-peaceful" is not the use or absence of armed force, but the larger purpose to which it is put. An aggressive act unlawfully initiated by one belligerent, may trigger a lawful, though overwhelming armed response from another in individual or collective self-defense. The latter response is not rendered "aggressive" even though it may involve a ferocious degree of force, or even what constitutes "an act of war." In this way, even an act of war may have a larger "peaceful purpose." To the extent a use of force is taken in self-defensive, or pursuant to a U.N. Security Council authorization, and is proportional to the initial aggressive act (that is, to the initial violation of the *jus ad bellum*), it complies with international law and may occur in space just as elsewhere. For a discussion of the requirement that the *jus in bello* principle of "proportionality" applies to acts of self-defense, see *Nicaragua*, *supra* note 219 at 103, paragraph 194 ("The Parties also agree in holding that whether the response to the attack is lawful depends on observance of the criteria of the necessity and the proportionality of the measures taken in self-defense.")

⁶⁴⁴ Perhaps the most difficult of all space law issues relates to the "delimitation," or "boundary," separating a State's territorial airspace and outer space. "There is no clear answer to the question of where space begins. But equally clearly, at some point above the earth, there exists an environment completely different from the one we have here. A sort of customary law has developed, ... to the effect that any object in orbit is in space, and that seems enough to satisfy everyone for the time being." Reynolds & Merges, *supra* note 21 at 12.

debris.” As noted previously, the Liability Convention defines “space object,” but its general circularity leaves the definition unhelpful.⁶⁴⁵ Functionally, the “space object” as used in international parlance includes “space debris.” As it is generally conceived, a space object includes any artifact, manned or unmanned, that is launched into orbit. This includes objects that have ceased to function and have become debris. The lack of legal definition for these basic terms makes the already difficult task of applying two distinct branches of international law to space combat that much more difficult.

2. Weaponization of Space

Beyond terms relevant to the militarization of space are those related to the more controversial prospect of space weaponization. Not only has the US historically eschewed the prospect of fielding space weapons, but even as their use has recently attracted renewed attention, some officers within the military publicly advocate a “space sanctuary” policy – that is, no weapons in space.⁶⁴⁶ If the US were to adopt this policy, one must immediately confront the question “what constitutes a weapon?” As one example, the meaning of “nuclear weapon” as used in the Outer Space Treaty may become less and less evident in future decades witnessing an evolution of space weaponry.⁶⁴⁷ While some hearing the term “nuclear weapon” may immediately equate it with thermonuclear devices designed for detonation under controlled circumstances, it is certainly correct to observe that “nuclear energy may be used in different ways and may be a potential weapon even if not so designed.”⁶⁴⁸ As a result, in the absence of clear definition, one could argue that following its malfunction the Chernobyl nuclear reactor, for example, became a “nuclear weapon.”

⁶⁴⁵ See *supra* note 450.

⁶⁴⁶ See works by DeBlois and Ziegler, *supra* note 3. Joseph Justin points out that the “space sanctuary” school “is fundamentally opposed to any military weapons in space.” Justin, *supra* note 3 at 104. Justin goes on to claim that the space sanctuary perspective “believes space should not be used as a military instrument of policy” and that the military role in space is to work for demilitarization. Although this may represent the classic sanctuary position, DeBlois and Ziegler do not advocate space as a sanctuary free from any military presence, just free from weapons.

⁶⁴⁷ See *supra* note 438 for further discussion of the definition of “nuclear weapons” as applied to X-ray lasers.

⁶⁴⁸ S. Gorove, “Space Without Weapons: International Legal Aspects of Weapons and Harms” in N.M. Matte, ed., *Space Without Weapons* (Montreal: Center for Research in Air and Space Law, McGill University, 1989) at 29 [hereinafter Gorove, “*Space Without Weapons*”].

Further complicating any legal analysis of the permissible scope of the weaponization of space one confronts a further definitional vacuum. Despite the heavy militarization of space, the basic term "space weapon" lacks definition in international law. As a result, the concept it represents, which broadly speaking includes any implements of warfare in space, is difficult to isolate for purposes of analysis. And, without this foundational definition, one cannot define phrases on which logically relies, such as "nuclear weapon" and "weapon of mass destruction." The difficulty arises in that any comprehensive definition of "space weapon" will include space systems equally used for non-military, non-destructive, and non-aggressive purposes. Though "space weapons" may seem to include only a discrete class of armaments with easily definable characteristics, a closer examination "reveals a less obvious and more inclusive set of systems."⁶⁴⁹

One proposed definition illustrates this challenge:

A space weapon is a device stationed in outer space (including the moon and other celestial bodies) or in the earth environment designed to destroy, damage, or otherwise interfere with the normal functioning of an object or being in outer space, or a device stationed in outer space designed to destroy, damage, or otherwise interfere with the normal functioning of an object or being in the earth environment. Any other device with the inherent capability to be used as defined above will be considered as a space weapon.⁶⁵⁰

Of particular interest is the second sentence. While it acknowledges that space objects not designed as weapons may *become* weapons if they can "be used" as such, it arguably leaves the definition so broad as to include just about any object at all.

Objects in orbit travel at roughly 17,000 miles per hour. This fact alone gives them the "inherent capability" to destroy or interfere with an object or being in space or in the Earth environment. This is equally true of functioning satellites, "dead" satellites, and space debris. Similarly, under this definition commercial telecommunications satellites are "space weapons" as they have the inherent capability to "interfere" with the normal functioning of other telecommunications satellites. Indeed a rifle or even a

⁶⁴⁹ P.B. Stares, "The Problem of Non-Dedicated Space Weapon Systems" in B. Jasani, ed., *Peaceful and Non-Peaceful Uses of Space: Problems of Definition for the Prevention of an Arms Race* (New York: Taylor & Francis, 1991) 147 [hereinafter Stares, "Non-Dedicated Space Weapon Systems"].

⁶⁵⁰ B. Jasani, "Introduction" in B. Jasani, ed., *Peaceful and Non-Peaceful Uses of Space: Problems of Definition for the Prevention of an Arms Race* (New York: Taylor & Francis, 1991) 13 [hereinafter Jasani].

hunting knife on Earth possesses the capability to destroy and/or interfere with a ground station, making impossible the normal functioning of the satellite it supports. These observations are not intended to suggest "space weaponry" should not be defined. They are simply intended to illustrate the difficulty of creating a definition that will distinguish "space weapons" from the larger categories "weapons," "space objects," or even "objects."

Put another way, should the developing law of war ever proceed to restrict the use of existing or potential space weapons, the definition of space weapons will have to confront the difficult problem of what to do about "non-dedicated systems" – that is, those space systems not designed as weapons.⁶⁵¹ It will also have to elucidate whether the restriction applies to the weapon's subcomponents as well.⁶⁵² A consensus among States on such a definition will facilitate application of the law of war to armed conflict in space.

In the meantime, consideration of technologies useful for space combat will proceed under the principle that State action is permitted in the absence of clear legal prohibition.⁶⁵³ Though regularly denounced by a large segment of the international community as destabilizing for the use and exploration of outer space,⁶⁵⁴ in principle none

⁶⁵¹ Stares, "Non-Dedicated Space Weapon Systems," *supra* note 649 at 147. Stares goes on to suggest 5 criteria that assist in determining the military capability of non-dedicated systems: "1. Operational readiness. How soon could the non-dedicated system be readied for use as a space weapon? What does it entail to make it ready? Are trained personnel available to convert it and use it for this purpose? Are the necessary support systems, such as target detection and tracking sensors also available? 2. Target coverage. What targets does the non-dedicated system realistically threaten? How many such attacks can it carry out? 3. Speed of attack. How quickly can single or multiple attacks using non-dedicated systems be carried out? Is there any warning associated with their use that might allow defensive countermeasures to be implemented? 4. Operational confidence. What is the probability that single and multiple attacks using non-dedicated systems will succeed in their intended mission? 5. Operational costs. What, if any, are the military or political costs associated with the use of non-dedicated systems as space weapons?" *Ibid.* at 151. With reference to ASATs, non-dedicated systems are also termed "residual" ASATs. See Stares, *Space and National Security*, *supra* note 150 at 3.

⁶⁵² Professor Gorove, referring to nuclear and other weapons of mass destruction, maintains that "unless specifically covered, subcomponents which in themselves do not qualify as a weapon, should not be taken to be included in a ban relating to the weapon." Gorove, "Space Without Weapons," *supra* note 648 at 31.

⁶⁵³ See *supra* note 219.

⁶⁵⁴ Indeed, the Soviet Union went so far as to present a "Draft Treaty on the Prohibition of the Stationing of Weapons of Any Kind in Outer Space" to the 36th Session of the U.N. General Assembly on 20 August 1981. In pertinent part, the draft treaty would have required "States Parties ... not to place in orbit around the earth objects carrying weapons of any kind, install such weapons on celestial bodies, or station such weapons in outer space in any other manner, including on reusable manned space vehicles of an existing type or of other types which States Parties may develop in the future." (Article 1(1)). It would have equally required States Parties "not to destroy, damage, disturb the normal functioning or change the flight

of the potential means and methods of space warfare discussed previously in Chapter Two, with the exception of nuclear weapons, violate international law.⁶⁵⁵ Of course, the use to which these weapons are put could render them unlawful for a specific objective if, for example, their use rendered them “disproportionate” (or “indiscriminate” or “inhumane”) under the law of war as judged against the military objective in view. But this is an inherent possibility for any weapon which, by itself, does not render the weapon unlawful.

3. Use of Force in Space

Beyond definitional limitations, a thorough articulation of legal standards applicable to space warfare should account for the ways most likely to trigger *jus ad bellum* restrictions on the resort to the use of armed force. One commentator has observed that space law, including the Limited Test Ban Treaty, Outer Space Treaty, Anti-Ballistic Missile Treaty, and the Moon Agreement, was developed to “permit,

trajectory of space objects of other States Parties, if such objects were placed in orbit in strict accordance with article 1, paragraph 1, of this treaty.” (Article 3). The draft treaty’s full 9 articles are reprinted in C.S. Gray, *American Military Space Policy: Information Systems, Weapon Systems and Arms Control* (Cambridge, MA: Abt Books, 1982) at 115 [hereinafter Gray]. While the treaty would not have prohibited land-based ASATs, it would have significantly expanded the scope of the partial dewaterproofing provision of Article IV, OST. The US “dismissed the Soviet draft treaty as a hypocritical propaganda ploy.” Stares, *The Militarization of Space*, *supra* note 87 at 230. Following announcement that the USSR would unilaterally refrain from deploying ASATs “for the entire period during which other countries, including the USA, will refrain from stationing in outer space antisatellite weapons of any type,” the Soviets presented a second draft treaty that would have prohibited the testing and deployment of “any space based weapons intended to hit targets on the Earth, in the atmosphere, or in space.” *Ibid.* at 231. Over great scientific and congressional pressure, the Reagan administration rejected this proposal as well citing the extreme difficulty, if not “impossibility,” in verifying an ASAT treaty. *Ibid.* at 233.

⁶⁵⁵ After a discussion of the relevant provisions of the *Outer Space Treaty* and the *Moon Treaty*, *infra* notes 405 and 497, respectively, Professor Christol observed in 1988 that “[i]n the years since 1967 [*Outer Space Treaty*] and 1979 [*Moon Agreement*] science and technology have perfected new generations and families of weapons, including those employing highly focused energy, such as laser weapons, and those based on sub-atomic particles, such as particle beam weapons. Pursuant to the general legal principle that which is not prohibited is permitted, it may be concluded that the more recent exotic weapons do not fall within the constraints of the foregoing treaty provisions.” C.Q. Christol, “Outer Space: Battle-Ground of the Future?” in C.Q. Christol, *Space Law: Past Present and Future* (Deventer, The Netherlands: Kluwer Law and Taxation Publishers, 1991) 59 (reprinted from M. Cohen & M.E. Gouin, eds., *Lawyers and the Nuclear Debate* (Ottawa: University of Ottawa Press, 1988)). The Russians have objected to the orbiting of particle beam weaponry claiming that it constitutes a “weapon of mass destruction.” Taylor, *supra* note 176188 at 34. However, given its likely capacity for great precision, the weapon need not generate “mass” destruction, though it may be lethal for its intended target. Some authors suggest, inexplicably, that just about all space weapons constitute weapons of mass destruction. See for example, M.N. Andem, “Implementation of Article IV of the *Outer Space Treaty* of 1967 During the 21st Century” in *Proceedings of the Fortieth Colloquium on The Law of Outer Space* (Reston, VA: AIAA, 1998) 338 at 344.

indeed to endorse, the arms race, including the militarization of space.”⁶⁵⁶ Though speaking with a sense of irony and regret, this scholar’s comments raise the twin questions of the law’s tolerance of one State’s infliction of intentional damage on another’s assets, and of the capture of foreign space assets. Though the U.N. Charter forbids the “threat or use of force against the territorial integrity or political independence of any state, or in any other manner inconsistent with the Purposes of the United Nations,”⁶⁵⁷ the meaning of this prohibition remains hotly contested. The prevailing view is that this provision is an absolute bar to the use of force with the sole exceptions being self-defense and authorization by the Security Council. The other view, greatly bolstered by the recent NATO air war into Kosovo, asserts that the prohibition pertains only to the use of force for purposes inconsistent with the Charter such as the subjugation of another State, or annexation of its territory.⁶⁵⁸ A State’s interpretation of the general prohibition on the use of force will obviously greatly impact its decision whether or not to use it. For example, if a State finds in the Charter no prohibition on individual or collective “humanitarian intervention,” it will expand to the uses of force it deems lawful in any of the combat environments, including space.⁶⁵⁹

Beyond general principles under the *jus ad bellum*, one can find reference to the intentional use of force within space law itself. A careful reading of the Liability Convention discloses that the *corpus juris spatialis* implicitly recognizes that under certain circumstances the intentional destruction of space objects might occur.⁶⁶⁰ As previously discussed, the Liability Convention subjects States Parties to “absolute” liability for damage caused by its space objects on the earth’s surface, or to aircraft in flight,⁶⁶¹ and to liability based on fault for damage by its space object to the space object of another State “being caused elsewhere than on the surface of the earth.”⁶⁶² However,

⁶⁵⁶ M.M. Matte, “A Treaty for ‘Star Peace’” in N.M. Matte, *Arms Control and Disarmament in Outer Space*, vol. II (Montreal: McGill University, Center for Research of Air and Space Law, 1987) 190.

⁶⁵⁷ Article 2(4), *supra* note 351 at 6.

⁶⁵⁸ Vlasic, “Negotiating and Drafting Agreements Relating to Outer Space,” *supra* note 410 at 211.

⁶⁵⁹ The more restrictive view of Article 2(4) is admittedly difficult to square with the Charter’s plain language and the historic reticence in the U.N.G.A. against foreign interventions. Nonetheless, “[e]xamination of the language and the negotiating background of Article 2(4) provides no unequivocal indication of its intended meaning.” *Ibid.*

⁶⁶⁰ Hurwitz, *supra* note 378 at 148-150.

⁶⁶¹ *Liability Convention*, Article II, *supra* note 463 at 189.

⁶⁶² Article III, *ibid.* at 190.

Article VI provides exoneration from absolute liability in cases where either the claimant State, or the natural or juridical persons it represents, caused the damage wholly or partially by (1) gross negligence, or (2) an act or omission done with intent to cause damage.⁶⁶³ A proper understanding of the phrase “intent to cause damage” provides insight into the Convention’s foresight as to the possibility of uses of force against space objects.

Under Article VI, the scope of the exoneration applies only as to “absolute liability” under Article II, and therefore exoneration from liability for damage by space objects done on the surface of the earth or to aircraft in flight. Given the purpose of space objects, that is, launch into space, this provision for exoneration would certainly include intentional acts taken against space objects *while in space* that later cause damage on the Earth or in the air. Obviously, the exoneration for intentional damage caused by a claimant State presupposes the possibility that such intentional damage will occur. Thus, despite the provisions of the Outer Space Treaty prescribing the “peaceful” use and exploration of space, the Liability Convention recognizes the distinct possibility that States may engage in intentional damage to space objects. While this does not imply the Convention’s sanction for such events,⁶⁶⁴ it does suggest that the international community realistically expected that a claimant State might take action amounting to the intentional damaging of a space object.⁶⁶⁵

⁶⁶³ Article VI, *ibid.*

⁶⁶⁴ In fact the exoneration from liability shows the very opposite. The Convention purports to punish States engaging in intentional destructive acts by eliminating their remedy against the launching State. As Article VI(2) establishes however, if the damage is caused by activities of the launching State that are inconsistent with the international law, including the *U.N. Charter* and the OST, there will be no exoneration from absolute liability “whatever.” *Ibid.* at 190-191. This would mean that an aggressive military operation by launching State A that causes damage on the Earth or in the air to claimant State B, will result in no exoneration of absolute liability for State A even if State B contributed to the damage by acts done with an intent to cause damage.

⁶⁶⁵ After observing that the US ratified the *Liability Convention* only “after being advised by the Department of State that the Convention did not apply to international damage,” Hurwitz concludes from this that “the US has recognized the right to intentionally damage another State’s space objects with impunity (as least as far as the 1972 Convention is concerned).” Hurwitz, *supra* note 378 at 149. Whether this overstates the US position or not, it does seem clear that the Convention exonerates one State from liability only as against intentional damage caused by the *claimant* State or the natural or juridical persons it represents. (Article VI(1), emphasis added) Thus, the US Department of State was certainly correct that the Convention does not “apply” (that is, create liability), as against one State in cases where the claimant State has at least “partially” caused intentional damage.

Legally speaking, the capture of a foreign space object is related to the question of intentional uses of force. Under Article VIII of the OST a State Party to the Treaty "on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object."⁶⁶⁶ At face value, this means that a satellite, for example, registered by State X belongs to State X for purposes of "jurisdiction and control." Nonetheless, when State X uses its satellite to intentionally and wrongfully disable State Y's satellite, assuming that doing so amounts to an "armed attack" under Article 51 of the U.N. Charter, State Y may in self defense disable State X's satellite.⁶⁶⁷ In such circumstances, State X has violated one of the conditions assumed to exist by the Outer Space Treaty – the peaceful use of outer space. Having properly acted in self-defense, may State Y capture State X's aggressor satellite for intelligence or other purposes? It certainly seems that the law of war authorizes belligerents not only to kill opposing belligerents but to destroy their weaponry. If State Y can lawfully destroy State X's satellite, it can certainly capture it, Article VIII of the OST notwithstanding. Put otherwise, the only way a State may be assured the protection of its space assets, is to ensure that its activities remain compliant with international law, including space law and the *jus ad bellum*.

C. National Policy, Military Space Doctrine, and Law of War Manuals

A review of the US space policies at the Presidential and Department of Defense (DoD) levels reveals that the leadership invariably reserves a place for national security and military activity within its space policy statements. In fact, current US national space policy directs the DoD to assume certain space missions that, when implemented, will have the effect of preparing the US for armed conflict in space. As a result, US space policy precipitates the need for an examination of the laws of war. Increasingly, prominent observers are calling for full implementation of US military space policy

⁶⁶⁶ *Supra* note 405, 610 U.N.T.S. at 209.

⁶⁶⁷ *Supra* note 351 at 24. Given the fact that Article 51 presupposes a previous customary right to self defense ("inherent right"), the right to respond by State Y may not even require the occurrence of an "armed attack," depending on the nature of the customary right. See *supra* note 251. State Y's act of self defense must also be proportionate to State X's provocation.

which would result in a robust combat capability.⁶⁶⁸ Nonetheless, as one military commentator observes, “[a]lthough the idea of space warfare is becoming prominent in [US] Air Force thinking, little effort has been made to flesh out what it means.”⁶⁶⁹ Also, it appears that little thought has been given to the question “how does or will the law of war limit a State’s ability to prosecute warfare in space?”

In establishing the current national space policy in 1996, President Clinton reiterated the requirement to use space for “peaceful purposes.”⁶⁷⁰ However, consistent with the 40-year US interpretation of the term, it does not exclude military activity such as intelligence-gathering or even armed defense: “‘Peaceful purposes’ allow defense and intelligence-related activities in pursuit of national security and other goals.”⁶⁷¹ More recently, the President’s national security strategy states that “our policy is to promote development of the full range of space-based capabilities in a manner that protects our vital national security interests.”⁶⁷²

The US national space policy covers several substantive areas comprising “Civil Space Guidelines,” “National Security Space Guidelines,” “Commercial Space Guidelines,” and “Intersector Guidelines.” The DoD is directed, *inter alia*, to “maintain the capability to execute the mission areas of space support, force enhancement, space control, and force application.”⁶⁷³ These four mission areas form the backbone of the DoD’s military space activity, as executed by its unified command for space, USSPACECOM.

⁶⁶⁸ For example, in arguing for an approach to space power that rests in part on the assertion that “America’s future security and prosperity depend on our constant supremacy in space,” United States Senator Robert Smith advocated a shift of “substantial” national military resources into space. He opined that “if we do, we will buy generations of security that all the ships, tanks, and airplanes in the world will not provide. This would be a real ‘peace-dividend’ – it would actually help keep the peace.” Smith, “The Challenge of Space Power,” *supra* note 27 at 33. Subsequently, he specified that the use of space to secure information superiority does not constitute space warfare stating that “if we limit our approach to space just to information superiority, we will not have fully utilized space power.” *Ibid.* at 34. Calling for a “space-power culture” within the US military, Senator Smith warns against allowing a “blanket of political correctness and bureaucratic inertia” from smothering revolutionary ideas. *Ibid.* at 35, 36.

⁶⁶⁹ *Supra* note 3 at 6. Major Newberry’s point could be applied equally to the US Army and Navy, and likely to the national security establishments of all other spacefaring states as well.

⁶⁷⁰ Fact Sheet: National Space Policy, Introduction, Paragraph (3), 19 September 1996, online: White House Homepage <<http://www.pub.whitehouse.gov>> (date accessed: 21 February 1999) [hereinafter National Space Policy].

⁶⁷¹ *Ibid.*

⁶⁷² A National Security Strategy for a New Century (Washington, DC: The White House, Office of the President, 1998) at 25.

With respect to the law of war, the DoD explicitly states that it is US policy to ensure that “[t]he law of war and the obligations of the US Government under that law are observed and enforced by the US Armed Forces.”⁶⁷⁴ Further, the DoD directs that “[t]he armed forces of the United States shall comply with the law of war in the conduct of military operations and related activities in armed conflict, however such conflicts are characterized.”⁶⁷⁵ At a minimum, these provisions mean that to the extent the law of war applies to space combat at all, and the US develops the means for conducting space combat, the law of war will apply to US forces in such combat.

As the titles to USSPACECOM’s four major mission areas suggest, the first two, “space support” and “force enhancement,” ensure that space assets facilitate the operations of combat forces on land, sea, and air. These missions are maturing rapidly and are leading to the “operationalization” of US space forces.⁶⁷⁶ The latter two missions, “space control,” and “force application,” are more controversial as they suggest the weaponization of space, and are most closely related to combat in a future theater of military space operations.

The notion of military “space control” strikes many observers as antithetical to the fundamental tenet of the Outer Space Treaty: that outer space is an environment free for use and exploration by all States. However, the current US policy does not purport to establish areas of exclusive control by US forces, but simply attempts to negate threats to US assets. US Deputy Secretary of Defense, John J. Hamre, recently explained that the space control mission is defensive in nature: “We fully believe that ‘negation’ in space – preventing the bad guys from using space against us – is fully authorized under international law, but we do want to take steps and actions that don’t create instability in the world.”⁶⁷⁷

The US space control policy is based on a five-pronged approach which includes (1) assured access to space and operation once there; (2) surveillance of the space environment and space-based objects; (3) protection of spacecraft, ground stations and

⁶⁷³ National Space Policy, *supra* note 670, “National Security Guidelines” at paragraph (6)(a).

⁶⁷⁴ DoDD 5100.77, *DoD Law of war Program* (10 July 1979) at para. C(1).

⁶⁷⁵ *Ibid.* at para. E(1)a.

⁶⁷⁶ W.B. Scott, “‘Milspace’ Maturing Into Warfighter Roles” *AW&ST* 147:9 (1 September 1997) 46.

⁶⁷⁷ W.B. Scott, “U.S. Adopts ‘Tactical’ Space Control Policy” *AW&ST* 150:13 (29 March 1999) 35.

data links; (4) prevention of damage and interference to US space infrastructure; and (5) negation of hostile space systems that place US and allied assets at risk.”⁶⁷⁸ This boils down into the following definition of space control, as articulated in USSPACECOM’s long-range plan: “Control of Space is the ability to ensure un-interrupted access to space for US forces and our allies, freedom of operations within the space medium and an ability to deny others the use of space, if required.”⁶⁷⁹ Translated into legal terms, the attempt to “ensure un-interrupted access to space” and to maintain “an ability to deny others the use of space,” are simply expressions in the military space context of the right to self defense in response to hostile action. As these policy goals are gradually implemented through practice they will require clarification as to the means and methods used.

Space force application contemplates the use of armed force originating from outer space. While the US maintains limited space control options, it has no acknowledged space force application capabilities – this is to say it has no operational space-based weaponry.⁶⁸⁰ The USSPACECOM Long Range Plan does not elaborate on this mission in nearly the detail it does for space control. According to General Richard Meyers, Commander, USSPACECOM, this is due in part to the fact that there is no national policy to weaponize space. While the President has assigned USSPACECOM the space force application mission, “[t]here’s been no national action on this. ... our focus now is looking at the concepts [of operation] and some of the basic technologies that would enable us to do that someday – *if* we’re tasked by the national command authority to go do that. ... Today there is relative harmony in space.”⁶⁸¹ If the US ever does proceed to the fielding of space force application options, it will most likely focus on missile defense.

Given the evolution of its national military doctrine, the US may soon be positioned to begin a preliminary incorporation of combat space operations into its law of war manuals. The obvious starting point would be its manual on air warfare.⁶⁸² Not only

⁶⁷⁸ United States Space Command, *Long Range Plan: Implementing USSPACECOM Vision for 2020*, (March 1998) 21 [hereinafter *Long Range Plan*]. See also *ibid*.

⁶⁷⁹ *Long Range Plan* at 11.

⁶⁸⁰ W.B. Scott, “Space Ops Threatened By Launch Failures” *AW&ST* 150:20 (17 May 1999) 25, 26.

⁶⁸¹ *Ibid*.

⁶⁸² AFP 110-31, *The Conduct of Armed Conflict in Air Operations* (November 1976).

would this course of action reflect the military's institutional acceptance of the law of war for space warfare, but it would allow the US to encourage the progressive development of that law. Military manuals serve not only as evidence of State *opinio juris*, but can also serve a limited lawmaking role as well. As has been observed: "Because international law notoriously lacks its own enforcement system, national implementation is often a critical factor in successful international lawmaking. ... Certainly, both the absence of a manual or the use of manuals whose content does not include the relevant norms would strongly suggest that those norms have not been adopted."⁶⁸³ The role of law of war manuals in making international law could be especially helpful for space warfare at its advent. A consensus among the leading States regarding acceptable limits on space warfare, as reflected in their law of war manuals, could prove as authoritative as a treaty. Meantime, incorporating what norms that do exist for space warfare into a law of war manual, as well as defining the US understanding of means and methods of space combat that are compliant with the law, would likely influence other States to adopt and act on them as well.

D. "Information" Warfare

As the technological information revolution that has characterized late twentieth century life finds increasing military applications, military strategists are recognizing in new ways the age-old importance of information as a component of warfare.⁶⁸⁴ Though it is a subject raising difficult legal questions well beyond the scope of this thesis, information warfare merits attention given its natural connection with space telecommunications systems. Because of heavy US reliance on high technology for its military effectiveness, potential threats to the information infrastructure will significantly affect combat readiness.⁶⁸⁵ This fact led a recent Air Force study examining future

⁶⁸³ W.M. Reisman & W.K. Leitzau, "Moving International Law from Theory to Practice: the Role of Military Manuals in Effectuating the Law of Armed Conflict" in H.B. Robertson, ed., *The Law of Naval Operations*, International Law Studies, vol. 64 (Newport, RI: Naval War College Press, 1991) at 8.

⁶⁸⁴ General Fogleman, former Air Force Chief of Staff recently asserted that "[d]ominating the information spectrum is as critical to conflict now as occupying the land or controlling the air has been in the past." Quoted in AFDD 2-5, *Information Operations* (5 August 1998) at 1.

⁶⁸⁵ Such potential threats have not escaped DoD's notice. For example, fears about potential unauthorized access have prompted serious debate over whether the military should withdraw from the internet altogether. "DoD May Unplug from Internet Due to Security Worries at Century's End" *Inside the Army* (21 June 1999) 1.

concepts, capabilities, and technologies to conclude that “influence increasingly will be exerted by information more than by bombs.”⁶⁸⁶

In conceptualizing its categories of activity, the US military distinguishes between “Information Operations,” those actions taken to affect an adversary’s information and information systems while defending one’s own information and information systems,⁶⁸⁷ and “Information Warfare,” which are information operations conducted during time of crises or conflict to achieve or promote specific objectives over a specific adversary or adversaries.⁶⁸⁸ Because the narrower concept of information *warfare* applies during time of armed conflicts, it will be the more relevant of the two concepts as analyzed in the context of space warfare.

Examination of emerging principles of information warfare will benefit the analysis of space warfare under the law of war in two respects. First, because the tactics of information warfare rely heavily on space assets, information warfare can be loosely conceived as being a component of space warfare.⁶⁸⁹ Whether classified as an active or passive manipulation of information, a State’s information operations in war certainly qualify as a “means” or “method” of warfare. In this respect, information warfare is subject to regulation under the *jus in bello*. To the extent information operations involve the use of force in an armed conflict, such operations must be “necessary,”⁶⁹⁰

⁶⁸⁶ *Air Force 2025*, *supra* note 51 at 4. The study went on to assert that “[t]he key to achieving and maintaining lasting superiority that cannot easily be duplicated by others lies in the integration of information, air, and space.” *Ibid.* at 9.

⁶⁸⁷ DoDD S-3600.1, *Information Operations* (9 December 1996). The US Air Force broadens this definition for its forces, including space forces, as follows: “Those actions taken to gain, exploit, defend or attack information and information systems and include both information-in-warfare and information warfare.” AFDD 2-5, *Information Operations* (5 August 1998) at 41. Information-in-warfare is defined as “the Air Force’s extensive capabilities to provide global awareness throughout the range of military operations based on integrated intelligence, surveillance and reconnaissance (ISR) assets; its information collection/dissemination activities; and its global navigation and positioning, weather, and communications capabilities.” *Ibid.*

⁶⁸⁸ DoDD S-3600.1, *Information Operations* (9 December 1996). As with “information operations,” the Air Force expands this definition as it recognizes the continuing engagement of defensive information warfare systems even absent crises or armed conflict: “Information operations conducted to defend one’s own information and information systems, or to attack and affect an adversary’s information and information systems.” AFDD 2-5, *Information Operations* (5 August 1998) at 42. Thus, on either definition, “information warfare” is a specialized kind of “information operations.” Unlike previous definitions, it includes more than just attack of command and control systems. *Ibid.* at vii.

⁶⁸⁹ Of course, information warfare and the multi-faceted operations it entails is not limited to the space environment. However, with the increasing reliance on space for telecommunications applications, the means of transmitting, intercepting, and corrupting information will entail use of satellite systems.

⁶⁹⁰ See *supra* Chapter Three, Section B.1. notes 223 through 227 and accompanying text.

“proportional,”⁶⁹¹ “discriminate,”⁶⁹² and “humane.”⁶⁹³ They must also comply with applicable conventional restrictions imposed under the Hague and Geneva systems.⁶⁹⁴

In his 1998 annual report to the President and Congress, US Secretary of Defense William S. Cohen highlighted this relationship between military space assets, and the acquisition and manipulation of information for strategic superiority.

DoD is moving into the information age and toward a totally integrated battlespace, where communications and intelligence space systems are no longer viewed as solely supporting capabilities to the warfighter, but *as instruments of combat*. The space force structure represents a major component of the information infrastructure and will become increasingly important in deterring conflict and conducting future military operations. Space forces provide the sole means to access otherwise denied areas of foreign countries without violating their sovereignty.⁶⁹⁵ (emphasis added)

⁶⁹¹ Section B.2, *supra* notes 228 through 238 and accompanying text.

⁶⁹² Section B.3, *supra* notes 239 through 243 and accompanying text.

⁶⁹³ Section B.4, *supra* notes 244 through 255 and accompanying text.

⁶⁹⁴ See *supra* Chapter Three, Sections C.1 & C.2.

⁶⁹⁵ Department of Defense, *Annual Report to the President and the Congress*, 1998, Chapter 7, p.1. The observation that space operations provide access to foreign countries “without violating their sovereignty,” though not specifically tied to the legal regulation of information warfare, requires some clarification as it might apply to space warfare. It is certainly true that space surveillance and reconnaissance activities, even if conducted by foreign militaries, do not violate a sensed-State’s sovereignty. This includes all manner of remote sensing and electronic interception. Yet as space operations evolve into “instruments of combat,” actual destruction of an adversary’s space assets is likely to be accompanied by claims that its “sovereignty” has been violated. The implications under the *jus ad bellum* are obvious and the question will increasingly merit attention, particularly because a State’s sovereignty is generally tied to its “territory.” The OST outlaws the “national appropriation” by “claim of sovereignty” of outer space, including the moon and other celestial bodies (Article II, *supra* note 405 at 206). By itself, this does not mean that States will not have sovereign rights in space. Article II was tested in 1976 when eight equatorial States attempted to claim sovereignty in portions of the geosynchronous orbit by means of the dubious “Bogota Declaration.” Predictably, such claims were roundly rejected by the international community which, on the authority of the OST and common sense, refused to recognize sovereign rights in portions of outer space itself. The claims of these states (Columbia, Brazil, Ecuador, Congo, Kenya, Uganda, Zaire, Indonesia), four of whom had previously ratified the OST, “has met with technically constructive as well as legally well-reasoned refutations by a majority of member states of the U.N. in those international fora where it has been reiterated.” M.N. Andem, *International Legal Problems in the Peaceful Exploration and Use of Outer Space* (Rovaniemi, Finland: University of Lapland Publications, 1992) at 160. Beyond assertions of sovereignty over natural resources from space, or portions of space itself, lies the question of whether the OST allows for “sovereignty” in a space *asset* itself and not just property rights. The OST provides that States retain “jurisdiction and control” as well as “ownership” over the space objects on its registry. (Article VIII, *ibid.* at 209). The ISS uses similar language (“ownership,” “jurisdiction and control”) without vesting national sovereignty in the asset. (Articles 5 and 6, *supra* note 29 at 5). However, because Article II of the OST focuses on national appropriation, only secondarily mentioning sovereignty as one of several means of effectuating a national appropriation (that is “by claim of sovereignty, by means or use or occupation, or by any other means”), it appears that a limitation on State sovereignty over its space assets, if any, will not come by operation of Article II. Certainly States have already “appropriated” objects that they own and control. In effect, States already maintain a “national appropriation” over their assets in space. A

A second reason for examining information warfare relates to the scholarly commentary suggesting means of applying established legal categories to this new way of waging war. As with information warfare, space warfare will require legal analyses that either convincingly demonstrate how current international law will regulate anticipated space operations, or conclude that international law is currently insufficient to the task. The increasing appearance of innovative analyses applying traditional legal categories to developing information warfare tactics could contribute greatly to the clarification of the *jus in bello* for space.⁶⁹⁶

E. Selected Issues

After considering the general application of the law of war to military space activities, several problems related to space warfare remain. The following are simply representative of many others that have been raised (and will be raised) as the prospect of space warfare moves from theory into the fielding of forces.

1. *Military Interaction With Intergovernmental Agencies and "Dual Use" Assets*

Because space warfare will be very "hardware-intensive,"⁶⁹⁷ the status of the assets used in combat will become all-important. In isolating the legal status of a space system to be used in combat, the answers to two preliminary questions can assist in

possible source limiting a State's sovereignty rights in its space assets comes from Article XII of the OST which requires that all "stations, installations, equipment and space vehicles on the moon and other celestial bodies shall be open to representatives of other States Parties to the Treaty on a basis of reciprocity." *Supra* note 405 at 211. Typically, spaces over which a State exercises its sovereignty may be closed to foreign entrance. However, although with this provision States Parties give up a measure of exclusive occupation and privacy in their space objects on the Moon and other celestial bodies, such does not necessarily imply a loss of sovereignty. As a practical matter, the question of State sovereignty in its space objects is relatively unimportant for civil and commercial activities given the "jurisdiction and control" and "ownership" provisions of Article VIII, OST. However, the question may become acute as the prospect of military confrontation in space increases and States engage in hostilities that may constitute an acts of war. For an interesting recent discussion of State jurisdiction in outer space, see W.P. Heere, "Problems of Jurisdiction in Air and Outer Space" (April 1999) XXIV:2 Air & Sp. L. 70.

⁶⁹⁶ Examples of such analyses include: M.N. Schmitt, "Computer Network Attack and the Use of Force in International Law: Thoughts on a Normative Framework" (1999) 37:3 Col. J. Transnat'l L. 885; R.G. Hanseman, "The Realities and Legalities of Information Warfare" (1997) 45 A.F.L.R. 173; S.P. Kanuck, "Information Warfare: New Challenges for Public International Law" (1996) 37 Harv. Int'l L. J. 272.

⁶⁹⁷ As suggested in the Introduction, as the practice of space warfare is currently evolving, for the near future it will likely entail principally the targeting and destruction of unmanned assets both within airspace and outer space.

clarifying an otherwise complicated analysis. First, who owns the asset? And second, is the asset used solely for military purposes, or *both* civilian and military purposes?⁶⁹⁸

When ownership of a space asset is shared among several States, the use of the asset becomes subject to the international agreement creating the joint ownership. The complexity of the analysis increases in part because there are more decision-makers with a voice in the decision as to how the asset will be used. When it comes to the use of a space asset in an armed conflict, the status of the owner largely determines the status of the asset. For example, the telecommunication network known as INTELSAT⁶⁹⁹ is jointly owned by over one hundred sovereign States. Each of these States has a weighted vote in determining the future of the organization and the uses to which its assets are put.

Similarly, the International Maritime Satellite Organization (INMARSAT) is an intergovernmental body owning a network of satellites supporting mobile telecommunications. Though INMARSAT had been used in support of several previous armed conflicts, the use among coalition forces during Operation Desert Storm in 1991 was much more widely publicized. This might not have been significant but for the "peaceful purposes" objective mandated by the INMARSAT Convention.⁷⁰⁰ Unlike the term in the Outer Space Treaty, Moon Agreement, and other selected international instruments, the term in the INMARSAT convention has been interpreted to mean those purposes unrelated to armed conflict.⁷⁰¹ Attempting a position that is "overly careful and conservative," States making up the INMARSAT organization, which include NATO, former Warsaw Pact, and developing nations, took the view that while "peaceful purposes" as used in the Convention does not exclude "military uses" *per se*, it does

⁶⁹⁸ Phrasing the issues in this way is intended to illustrate that the problem of "dual use" assets can be understood in two different ways. The *use* of the asset can be "dual," as for example a remote sensing satellite used both for agricultural research as well as for evidence of war crimes. In this regard the NATO use of satellite imagery to establish the creation of mass graves could have come from civilian, commercially available remote sensing systems. Further the *ownership* of the satellite can be dual as between several States directly, or through participation in intergovernmental organizations such as INTELSAT and INMARSAT.

⁶⁹⁹ INTELSAT stands for International Telecommunications Satellite. See *Agreement Relating to the International Telecommunications Satellite Organization "INTELSAT,"* 20 August 1971, 23 U.S.T. 3813, T.I.A.S. 7532 (entered into force 12 February 1973).

⁷⁰⁰ Article 3 of the INMARSAT treaty requires that the uses of its assets be reserved for "peaceful purposes." *Convention on the International Maritime Satellite Organization*, 3 September 1976, 1143 U.N.T.S. 105, 31 U.S.T. 1 (entered into force 16 July 1979).

⁷⁰¹ W.D. von Noorden, "INMARSAT Use By Armed Forces: A Question of Treaty Interpretation" (1995) 23:1 J. Sp. L. 1 at 2.

exclude uses in armed conflict even if conducted in self-defense.⁷⁰² As reported by the INMARSAT's General Counsel during the 1991 Persian Gulf war, when INMARSAT notified the US of its concerns related to use of the Organization's assets in furtherance of armed conflict in Desert Storm, the State Department responded by assuring INMARSAT "that appropriate steps have been taken to avoid recurrence of such publicity."⁷⁰³ Without so stating, the distinct impression left by this and other commentators⁷⁰⁴ is that uses of the network during armed conflicts such as Desert Storm were inconsistent with the Convention's terms.

Because privately-owned global mobile personal telecommunications systems (such as the Iridium, ICO, Teledesic and Odyssey networks) are rapidly proliferating, it is doubtful military forces will need to rely on intergovernmental organizations such as INMARSAT for communication support in future conflicts. Despite numerous new legal issues it is creating, commercial satellite systems are increasingly servicing military communications needs.⁷⁰⁵ However, to the extent military forces continue to use intergovernmental assets, an equally difficult question relates to the status of those owner States that are not party to the armed conflict. As occurred with "neutral"⁷⁰⁶ INMARSAT

⁷⁰² *Ibid.*

⁷⁰³ *Ibid.* The author strongly implies that the US simply avoided the "peaceful purposes" issue by focusing instead on unwanted publicity.

⁷⁰⁴ See, e.g., R.A. Morgan, "Military Use of Commercial Communication Satellites: A New Look at the Outer Space Treaty and 'Peaceful Purposes'" (1994) 60 J. Air L. & Com. 237.

⁷⁰⁵ Once again, military wargames are precipitating discussion of potential legal issues. In the Army's 1998 "Space Game 2" an issue arose as to the use of commercial satellites and whether the US could or should attack either the space or ground segment. The now-familiar question "which of these options constitute an act of war?" also was raised. W.B. Scott, "Wargame Raises New Space Policy Dilemmas" *AW&ST* 148:8 (23 February 1998) 98.

⁷⁰⁶ The following discussion describes neutrality as a specific legal category within the law of war: "The term 'neutrality' designates the legal status of a State which does not participate in a war being waged by other States. A precondition, therefore, is the existence of a war between sovereign States or a civil war in which the rebels have been recognized as belligerents. ... In the case of a use of force which falls short of actual war, the laws of neutrality do not apply. ... Neutrality ends when the neutral State enters the war, but not if it uses force to counter a violation of its neutrality. ... A neutral State has the right to demand respect for its independence and above all for its territorial sovereignty, including its air space. ... The supreme precept is that the neutral State may not, by governmental measures, intervene in the conflict to the advantage of one of the belligerents. Measures that would assist a belligerent and those that would harm it are alike forbidden. This prohibition applies even if equal treatment for both parties is contemplated. Equality of treatment and impartiality are in this respect irrelevant. It is an obligation imposed on the government of the neutral State, but not on its nationals. ... Basically, neutral obligations are only of a political or a military nature." R.L. Bindschedler, "Neutrality, Concept and General Rules" in Bernhardt, ed., *Encyclopedia of Public International Law*, vol. 4 (Amsterdam: North-Holland Publishing Company, 1982) at 9-13.

States in Operation Desert Storm, use of the system by belligerent States meant that neutral (co-owner) States risked loss of their rights as neutral States under the law of war, at least as to their investment in the INMARSAT system if it had been lawfully targeted by enemy forces.

Reference to a specific law of war analogy may prove helpful in the analysis of the use and targeting of assets jointly owned by belligerents and neutrals alike. Under the law of war, an otherwise inviolable object or person, such as a church or non-combatant, may become a legitimate target for attack if used for military ends. Thus, the storage of weapons or the housing of soldiers in a church, or engagement in active combat by a non-combatant, renders both subject to attack. Similarly, an object owned by a neutral which would be otherwise inviolable as neutral property, becomes properly subject to attack if used by a co-owner for belligerent purposes. With one exception, this analogy would seem to apply to the vast majority of space assets co-owned by States within intergovernmental organizations, particularly telecommunications satellites.

A possible limitation of this analogy arises with reference to Hague Conventions V and XIII respecting the rights and duties of neutral powers and persons in case of war on land and sea, respectively.⁷⁰⁷ Although the titles suggest that each Treaty's scope is specifically limited to warfare on land or sea, such apparent limitations have not hindered application of *jus in bello* principles from the Hague Conventions to aerial warfare.⁷⁰⁸ Similarly, the provisions of both Treaties could logically be applied to space warfare. Article 8 of Convention V allows that neutral States need not "forbid or restrict the use on behalf of the belligerents of telegraph or telephone cables or of wireless telegraphy apparatus belonging to it or to companies or private individuals."⁷⁰⁹ Nonetheless, while the neutral State need not restrict the use of its assets to only non-belligerent States for "telegraph or telephone cables," Article 9 requires that any allowance by the neutral State

⁷⁰⁷ Reproduced in Roberts & Guelff, *supra* note 209 at 61 (V) and 109 (XIII).

⁷⁰⁸ As previously suggested, references to "bombardment" where used in the conventions governing land (IV) and sea (IX) warfare have been widely read to effect limits on means and methods of prosecuting air war. See, e.g., Parks, *supra* note 201.

⁷⁰⁹ Convention V, *ibid.* at 64. The specific reference to early instruments of telecommunications is particularly apt as applied to space warfare. The principal assets in which the "dual use" problem for neutral and belligerent co-ownership arises in space warfare will be for telecommunications satellites.

for belligerent use be “impartially applied by it to both belligerents.”⁷¹⁰ Thus, in keeping with customary principles of State neutrality, the Treaty forbids a neutral to give preferential treatment to one belligerent if it allows access to any. By clear inference, this means that to the extent the neutral State does give preference, the preferential access to the asset for one belligerent renders the “neutral’s” property non-neutral, and thus subject to attack.

An additional issue arises under Hague Convention V’s “general participation clause.” Article 20 provides that “[t]he provisions of the present Convention do not apply except between contracting Powers, and then only if all the belligerents are parties to the Convention.”⁷¹¹ Because, for example, the United Kingdom is not a party to the Convention, Article 20 operated to render its specific provisions inapplicable to the Persian Gulf conflict.⁷¹² Nonetheless, when drafted, Convention V, as well as Convention XIII, was viewed as declaratory of customary international law. Thus, without asserting that the Hague conventions on neutrality do in fact amount to restatements of customary law, Roberts & Guelff accurately point out that “[t]o the extent that the Convention [V] may be considered customary international law, it would be binding on all states and its ‘general participation clause’ ... would cease to be relevant. In hostilities since 1907, including both world wars, the Convention was frequently referred to by both neutrals and belligerents.”⁷¹³ Among other things, this simply illustrates that the law is unspecific on this point. How the Hague Conventions on neutrality or the principles of customary international law would restrict targeting of jointly-owned satellites in space warfare is as yet unclear. While this problem of “neutral” ownership of implements of war is not unique to space assets, it is an issue widely applicable to space assets given widespread intergovernmental cooperation in space, and is thus likely to become a concern in space warfare.

A second major problem related to the status of space assets in combat is the use to which they are put. In many cases, implements of space warfare can be converted

⁷¹⁰ *Ibid.*

⁷¹¹ *Hague Convention (V) Respecting the Rights and Duties of Neutral Powers and Persons in Case of War on Land*, reprinted in Roberts & Guelff, *supra* note 209 at 66.

⁷¹² Other non-parties to the Convention that were active to some degree in the 1991 Gulf War include Canada, Italy and Turkey.

⁷¹³ Roberts & Guelff, *supra* note 209 at 61.

fairly easily to valuable non-military uses.⁷¹⁴ For example, remote sensing satellites are functionally equivalent to military reconnaissance satellites. While the former do not require the same precision, the process of acquiring earth-based data is roughly the same.⁷¹⁵ Even more closely related are the uses put to weather and telecommunications satellites. The military may use such a satellite to support the prosecution of its wartime objectives while the same satellite is being used *simultaneously* for non-military purposes.⁷¹⁶ This raises the question whether such an asset may be lawfully targeted by an opposing belligerent.⁷¹⁷

The general rule provided by the law of war allows destruction of targets that are military objectives when doing so is not disproportionate to the military objective sought

⁷¹⁴ In addition to those cited below, perhaps the most obvious example of dual-use technology pertains to "launch vehicles." In the civilian context, launch vehicles are also termed "boosters" or simply transportation systems. In the military context, virtually the same launch vehicles become "missiles" and "rockets." This dual use potential for the same launch vehicle creates tension given the rise of commercial use of space. For example, the joint venture between US, Russian, Norwegian, and Ukrainian corporations to launch commercial satellites from an ocean-going oil rig was suspended in 1998 over missile technology concerns. The effort, popularly known as Sea Launch, uses a Russian Zenit rocket to boost the commercial payloads to orbit. The US State Department, fearful that Boeing was educating Russia on improvements to its missile design, halted work on the project. The Zenit rocket is a modified version of the Russian SS-18 ICBM. See J. Mintz, "U.S. Suspends Boeing-Ukraine Rocket Launch" *The Washington Post* (8 August 1998) at A14. The US has subsequently allowed work to resume.

⁷¹⁵ The dual-use character of remote sensing satellites benefits military and civilian organizations in both directions. Thus, military imagery finds useful civilian application as well. For example, declassification of photoreconnaissance from the early US Corona satellites has allowed for surface water studies. Recently-released imagery showed the size of the Soviet Aral Sea in 1962. By comparison with 1990s imagery, the considerable extent to which the sea has shrunk due to the diversion of water for irrigation becomes clear. Cited in C. Peebles, *The Corona Project: America's First Spy Satellites* (Annapolis, MD: Naval Institute Press, 1997) at 266. Peebles also notes that "[t]he first NASA Landsat earth resources satellite was launched in 1972 – a month after the end of Corona. With the Corona photos, environmental studies could be extended back another twelve years, helping to separate long-term changes from normal variations in such areas as movement of sand dunes, loss of forest areas, and shifts in the courses of tropical rivers." *Ibid.*

⁷¹⁶ Christol argues that this dual-use aspect of most space assets contributed "to the demise of the position that military activities in the space environment were inherently aggressive ... Space objects engaged in communications, observations of earth from space, weather observation, and geodesy could be engaged in either a military, a non-military, or both military and non-military activities." Christol, *Modern International Law of Outer Space*, *supra* note 423 at 28.

⁷¹⁷ A further permutation of the issue arises when several opposing belligerents simultaneously use the same asset. During Operation Desert Storm, both the Coalition and Iraq were using transponders off the ARABSAT telecommunication system. F.R. Clemenson, "Banning the Stationing of Weapons in Space Through Arms Control: A Major Step in the Promotion of Strategic Stability in the 21st Century" in J.M. Beier & S. Mataija, eds., *Arms Control and the Rule of Law: A Framework for Peace and Security in Outer Space* (Toronto: Centre for International and Security Studies, York University, 1998) 39. Aside from the issue of neutral State partial ownership of the system, there appears to be no *jus in bello* reason why either side could not have attacked the satellite. Though each side would have had to calculate whether it stood to

by the destruction. On this basis, major infrastructure targets were lawfully destroyed during the 1991 Persian Gulf War that provided, for example, electricity both to the civilian populations and to the command and control functions of the Iraqi military.⁷¹⁸ A similar rationale applies equally to dual use satellites. To the extent a satellite is used for the support of a military purpose, be it communications, weather, early warning of missile launch, or reconnaissance, it becomes a military objective and is lawfully subject to attack. This of course assumes that the space asset is actually used for such military purpose and is not merely targeted for having the potential to be so used.⁷¹⁹

2. The Status of Astronauts as Both "Envoys of Mankind" and Combatants

The trend for the past few decades, perhaps since termination of the MOL project and certainly since the last military space shuttle mission, suggests that military manned space missions will not carry the significance of unmanned missions in the near term. Nonetheless, there will undoubtedly be *some* role for military astronauts in space combat. This raises a few obvious questions in light of language used by the Outer Space Treaty and the Rescue and Return Agreement. In his account of the reception he received following the Apollo 11 manned mission to the surface of the moon, Command Module pilot Michael Collins made the following observations:

Travelling around the world several months after the flight, I was continually impressed by the fact that no matter where we were, the reaction was the same and, to me, unexpected. Never did I hear, 'Well, you Americans finally did it.' Always it was 'we,' we human

gain more than it lost by the attack, this amounts to a question of military tactics and strategy rather than permissible conduct under the law.

⁷¹⁸ Thus, in its Report to Congress on the conduct of the Gulf War, the US Department of Defense discussed the coalition attacks on major utilities, the Iraqi communications system, and bridges. The Report affirms that "[w]hen objects are used concurrently for civilian and military purposes, they are liable to attack if there is a military advantage to be gained in their attack. ('Military advantage' is not restricted to tactical gains, but is linked to the full context of a war strategy, in this instance, the execution of the Coalition war plan for liberation of Kuwait.)" *Department of Defense Report to Congress on the Conduct of the Persian Gulf War: Appendix O on the Role of the Law of war*, reprinted in (1992) 31 I.L.M. 612 at 623, 10 April 1992.

⁷¹⁹ If all that were required were a potential military use, *any* asset could be targeted. The homes of civilians far from the battlespace could potentially be used by military forces, but such are not lawful targets unless so used. Similarly, any satellite with a system of on-orbit propulsion is a potential kinetic ASAT for another satellite. This, by itself, does not make the satellite a military objective.

beings drawn together for one fleeting moment watching two of us
walk that alien surface.⁷²⁰

This reception correlates with the status astronauts bear under international law: “envoys of mankind.”⁷²¹ The lofty phrase reserved for astronauts appears to suggest that they are given the legal status of diplomats.⁷²² However, a significant tension will arise as military astronauts move from activities that are scientific in nature, to those that are warlike. Interestingly, the language immediately preceding the “envoys” phrase from the Outer Space Treaty states the permissibility of military personnel in space for scientific or other peaceful purposes.⁷²³ This juxtaposition suggests, along with the fact that the term “astronaut” applies to all humans in space⁷²⁴ and that the term “envoy” makes no distinction between military and civilian astronauts, that the term “envoy” as used in the OST certainly applies to military personnel in space. However, the OST does not countenance armed conflict in space.

Under the law of war there is no reason the term “combatant” could not apply to military personnel in space just as it does to individuals on land, sea, and air if authorized to engage in armed conflict.⁷²⁵ Formally speaking, in order to be accorded all legal protections under the *jus in bello* as “belligerents,” it seems that such combatant astronauts would be required to adhere to the requirements set forth under Article 1 of the

⁷²⁰ M. Collins, *Liftoff: The Story of America's Adventure in Space* (New York: Grove Press, 1988) at 161.

⁷²¹ Though “astronaut” was originally a US term referring to human beings in space, it can apply equally to humans in space from other countries, including those that may prefer the term “cosmonaut.” As used here, the two terms are synonymous and use of the one constitutes reference to both. The phrase “envoys of mankind” comes from the *Outer Space Treaty* which declares “States Parties to the Treaty shall regard astronauts as envoys of mankind in outer space and shall render them all possible assistance in the event of accident, distress, or emergency landing on the territory of another State Party or on the high seas.” *Outer Space Treaty*, Article V, *supra* note 405, 610 U.N.T.S. at 208.

⁷²² “The term ‘envoy’ has a precedent in diplomatic law, that of an envoy extraordinary. An envoy ranks just below an ambassador and always is an agent, a messenger. The reason for this unique concept lies in the fact that astronauts have been vested with the legal representation of all mankind in outer space and celestial bodies. No former representation has ever been as wide and politically, it goes beyond the most audacious ambition. On the other hand, this investment was recognized in the General Assembly by unanimity and acclamation.” A.A. Cocca, “Prospective Space Law” (1998) 26:1 J. of Space L. 51 at 54.

⁷²³ “The use of military personnel for scientific research or for any other peaceful purposes shall not be prohibited.” *Ibid.*

⁷²⁴ At the time of the adoption of the OST, virtually all US astronauts in space from the “Mercury” and “Gemini” projects had all been members of the US military.

⁷²⁵ It appears to be of little significance that the OST requires that astronauts be regarded as envoys of mankind “in outer space.” When read in context, this is not a geographic limitation for the exclusive area in which astronauts are to be regarded as envoys, but rather a claim that when away from earth, i.e. in outer space, astronauts represent the human race.

annexed regulations to Hague Convention (IV), that is: (a) commanded by a person responsible for his subordinates; (b) have a fixed distinctive emblem recognizable at a distance; (c) carry arms openly; and (d) conduct operations in accord with the laws and customs of war.⁷²⁶ Under such conditions, the legal tension between a person being accorded a quasi-diplomatic status, as well as being given the right to use force might appear to be acute. Because the term "combatant" is fairly well established under the law of war, full resolution of this potential tension requires placement of the term "envoy" in its proper context within the Outer Space Treaty.

The term as used requires an interpretation that is consistent with relevant assumptions made elsewhere in the Treaty and with its object and purpose. Indeed, this is a requirement imposed on the interpretation of any treaty.⁷²⁷ The same treaty that designates astronauts "envoys" also presupposes that States will abide by their obligation to limit national activity to peaceful purposes. A necessary precondition for any astronaut claiming combatant status will be some violation of the "peaceful purposes" injunction. That being the case, it is implausible to assert that any astronaut qualifying as a combatant, whether acting in an aggressive, non-peaceful role, or a defensive, peaceful role, will be accorded the diplomatic status due an "envoy." This conclusion is further supported by the fact that those accorded diplomatic immunity may not engage in armed hostilities.⁷²⁸ From this, two commentators have helpfully pointed out that "[a] military

⁷²⁶ *Supra* note 232 and accompanying text. Although the requirements to have a distinctive emblem "recognizable at a distance" and to "carry arms openly" certainly assume new meaning as applied to outer space, such requirements could be complied with in space just as they are on land, sea, or in the air. The central point of these requirements is to allow clear distinction between combatants and civilians, legitimate and illegitimate military targets. Failure to so identify oneself if done to take advantage of the enemy's goodwill, amounts to an act of perfidy, one of the most serious law of war violations as it undermines the entire system and the mutual "confidence" on which it is based. For a discussion of perfidy under *Protocol I* [to the Geneva Conventions], see *supra* note 244.

⁷²⁷ Article 31 of the *Vienna Convention* requires that a treaty be interpreted "in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in light of its object and purpose." *Vienna Convention*, *supra* note 354, 1155 U.N.T.S. at 340 [emphasis added]. Though the *Vienna Convention* came into force well after adoption of the OST, its provisions are widely viewed as simply codifying preexisting customary international law.

⁷²⁸ It is for this reason that diplomats stationed in foreign countries are accorded such wide protections under international law. Not only are their personal and professional premises, archives and documents, and persons deemed "inviolable," but they are free from the criminal jurisdiction of the receiving State. *Vienna Convention On Diplomatic Relations*, 18 April 1961, 500 U.N.T.S. 95, 55 A.J.I.L. 1064 (entered into force 24 June 1964).

astronaut [who] participates in hostile acts does not exercise diplomatic functions.”⁷²⁹ It would simply be incongruous for one person to simultaneously constitute a “combatant” and an “envoy of mankind.”⁷³⁰ The practical interpretation of the OST then becomes this: States Parties “shall regard astronauts as envoys of mankind” only when engaged in “peaceful” activities, as the OST assumes them to. When such conditions do not exist, it makes no logical or textual sense for astronauts to be regarded as “envoys” by opposing belligerent States.

3. Return of Astronauts Engaged in Combatant Activities

At least two treaties within the *corpus juris spatialis* require the prompt return of astronauts. In the event of accident, distress, or emergency landing on the territory of another State Party or on the high seas, the OST requires that astronauts be “safely and promptly returned to the State of registry of their space vehicle.”⁷³¹ The Rescue and Return Agreement makes the duty even more expansive, applying even to cases of “unintended landing.” Article 4 uses language suggesting that the duty to return is unconditional:

If, owing to accident, distress, emergency or unintended landing, the personnel of a spacecraft land in territory under the jurisdiction of a Contracting Party or have been found on the high seas or in any other place not under the jurisdiction of any State, they shall be safely and promptly returned to representatives of the launching authority.⁷³²

These provisions precipitate the question: “must combatant astronauts be returned in time of war?”

The answer is plainly “no” for reasons similar to those justifying the conclusion that astronauts engaged in armed conflict will not be accorded diplomatic immunity. In both cases, the terms of the Rescue and Return Agreement assume that the space activities of astronauts, even if military in nature, will be scientific and non-aggressive –

⁷²⁹ M. Bourbonniere, & L. Haeck, “Jus in Bello Spatialis” (Conference on Space Manufacturing, Proceedings of the Space Studies Institute, Princeton University, 7 May 1999) at 8 [publication forthcoming]. Once a diplomat takes up arms, he arguably loses his diplomatic protections. See J.S. Beaumont, “Self-Defense as a Justification for Disregarding Diplomatic Immunity” (1991) XXIX C.Y.I.L. (Vancouver: University of British Columbia, 1992) 391.

⁷³⁰ The OST itself hints at this by requiring that States Parties “regard” astronauts as envoys. This raises the subtle distinction between an astronaut actually *being* an envoy, and simply being “regarded” as one.

⁷³¹ *Outer Space Treaty*, Article V, *supra* note 405, 610 U.N.T.S. at 208.

that is, "peaceful." Once the outbreak of armed hostilities occurs in space, at least one of the States involved will have violated the "peaceful purposes" limitation. Whatever else the astronaut-combatants may be at that point, they most certainly will be prisoners of war if captured by virtue of accident, distress, emergency or unintended landing. The opposing belligerent will owe no greater duty to return the prisoner of war from space than it would the prisoner of war from the land, sea, or air.

4. "Innocent Passage" through Airspace for Destinations to and Return from Space

Beyond the question of where airspace ends and outer space begins, lies a problem many States face related to space access. States such as the US, with great land masses bounded by vast expanses of the oceans, have a certain degree of independence in the launch and recovery of their space objects. Because many States are entirely landlocked, or possess territory too small to launch objects into space using only their own airspace or that over the high seas, a question arises as to the possibility of incorporating into space law another feature from the law of the sea – innocent passage. In this case, several commentators have been proposing that for some States to truly enjoy the free exploration and use of outer space guaranteed by the OST, they must be accorded a right of innocent passage through the national airspace of other States. Some have gone even further to suggest that such a right exists in customary international law.⁷³³

As suggested previously, such a right does not exist in the law and is not likely to emerge in the near future given traditional State interests in territorial sovereignty.⁷³⁴

⁷³² *Rescue and Return Agreement*, Article 4, *supra* note 443, 672 U.N.T.S. at 122.

⁷³³ See S. Gorove, "Legal and Policy Issues Raised by the Proposed Notion of 'Aerospace Object,'" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 411; C.Q. Christol, *Space Law: Past, Present, and Future* (Boston: Kluwer, 1991) 339; M. Lachs, *The Law of Outer Space: An Experience in Contemporary Law-Making* (Leiden: A.W. Sijthoff International Publishing Company, 1972) at 59-60. Generally, the arguments rests on anecdotal evidence of spacecraft entering the national airspace of a foreign State without incident or objection.

⁷³⁴ *Supra* note 401. In addition to the arguments of Malanczuk and Wassenberg, additional space law commentators have made the argument cogently, including: A.D. Terekhov, "Passage of Space Objects Through Foreign Airspace: International Custom?" (1997) 25:1 J. Sp. L. 1; P. Haanappel, "The Aerospace Plane: Analogies with Other Modes of Transportation" in *Proceedings of the Thirty-Second Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1990) 341 at 342; B. Cheng, "The Legal Regime of Airspace and Outer Space: The Boundary Problem Functionalism Versus Spatialism: The Major Premises" (1980) V Ann. Air & Sp. L. 323 at 357. Indeed, while backing away from its earlier unequivocal assertions that such a right exists, Russia more recently stated that "[p]rovisions of international customary law with respect to the passage of aerospace objects after re-entry into Earth's atmosphere are currently in the

However, even if it did, it would not serve the ends of belligerent States in the midst of armed conflict during which passage would not be innocent. For passage to be "innocent" under the Law of the Sea Convention, it cannot be "prejudicial to the peace, good order or security of the coastal State."⁷³⁵ It is self-evident that foreign military activity in support of armed conflict in the territory of the host State (whether territorial seas or superjacent national airspace), absent explicit permission, will be prejudicial to the peace of that State. States may always attempt to secure prior permission before entering the national airspace of another State. This could certainly occur during an armed conflict. However, as long as the law of the sea remains the controlling analogy, any future recognition of rights to innocent passage into foreign national airspace for space objects, will not apply to belligerents during armed conflict.

process of being elaborated." *Questionnaire On Possible Legal Issues with Regard to Aerospace Objects: Replies from Member States*, U.N. Doc. A/AC.105/635, 15 February 1996, at 10.

⁷³⁵ Article 19, *LOS Convention*, *supra* note 552, 21 I.L.M. at 1274.

Conclusion

[I]f there was ever a threat to our national security [in space],
the best – the only – way to solve the problem
is to take weapons into space.⁷³⁶

General Howell M. Estes, III, USAF (1997)

Before examining *how* the law of war will restrict means and methods of space warfare, it is necessary to determine *whether* it applies to military space operations in the first place. Given the evolution of aerial warfare – gradual restrictions on means and methods applied from the existing law of war – and the apparent similarity of certain aspects of the maritime environment to that of outer space, one can apply the traditional set of norms known as the law of war to space warfare by employing a process of analogical reasoning. The conclusion that the existing law of war will apply to space warfare is further supported by treaty bases in the Outer Space Treaty and the law of war's Martens' clause.

That said, when it comes to outlining permissible military activity during the course of space combat, it appears equally clear that the near-total atmospheric vacuum characterizing outer space is matched by a similar legal vacuum with respect to the *jus in bello* for space warfare. Academicians and practitioners are left to making educated but uncertain guesses based on analogies with other legal regimes. As with any attempt to predict the application of current (though insufficient) legal regimes to future phenomena, it is extremely difficult to articulate with any precision how this application should occur. The difficulty is largely a function of developing warfare technologies that continue to outpace the progressive development of international law. Ideally however, the task should fall to diplomats and international legislators having the authority to negotiate clarifications to international law before the relevant issues are unilaterally decided by States in the context of actual combat.⁷³⁷

⁷³⁶ Quoted in Scott, "Space As New Area of Responsibility," *supra* note 2 at 55.

⁷³⁷ This prospect appears unlikely. Following his discussion of events at the U.N. Conference on Disarmament, Professor Vlasic plausibly asserts: "It may not be too far-fetched to conclude that the position of certain States on the issue of space weapons reflects their desire not to be subject to restrictions, at least not yet, by an international legal instrument, even if only a U.N.G.A. resolution, condemning in unambiguous terms the development, testing and deployment of devices, wherever based, designed to attack or interfere with space assets." Vlasic, "Space Law and Military Technology," *supra* note 52 at 407.

The prospect of space warfare requires the formulation of a new perspective on the law of war. The "law of war" contains prescriptive norms derived from a wide variety of sources. With respect to space warfare, the *corpus juris spatialis*, in addition to a variety of arms control treaties, contributes additional restrictions to the existing law of war. Having concluded that the traditional law of war will apply to space warfare, and employing the most widely accepted understandings of the terms "peaceful" and "space weapon," an examination of relevant legal sources demonstrates that the following military activities are prohibited at this time:

- Interference with space-based "national technical means" (space based sensors) for arms control verification as between the US and Russian Federation;
- Placement of nuclear weapons and other weapons of mass destruction in orbit around the earth and on celestial bodies or in orbit around them;
- Testing or other detonation of nuclear weapons in outer space;
- Placement of military bases and conduct of military tests or maneuvers on celestial bodies and in orbits around them;
- Destruction of targets that are not military objects or militarily necessary, and are specifically prohibited such as hospitals, churches, and non-combatants;
- Use of space weapons or tactics that are "inhumane," "disproportionate" to the militarily necessary objective sought, or are incapable of use so as to "distinguish" between legitimate and illegitimate targets (as the terms are used under the traditional *jus in bello*);
- Development, testing, and deployment of space-based or other anti-ballistic missile systems and components (with a single limited exception);
- Military or hostile use of environmental modification techniques in outer space.

By contrast, an examination of the same sources discloses that, at a minimum, the following military activities in outer space are not prohibited:⁷³⁸

- The use of military personnel;
- The use of space-based remote sensors in support of combat or other military purposes;
- The use of space-based communication, navigation, and meteorological systems for combat or other military purposes;

⁷³⁸ As stated previously, given the continuing implications of State sovereignty in international relations, it is important to conceive State behavior not as *authorized* by international law, but rather inherently lawful unless proscribed by international law. See *supra* note 219. Accordingly, it is appropriate to speak of activity that is "not prohibited" or "consistent with international law."

- The deployment and non-aggressive use of conventional space weapons; and
- The transiting of nuclear and other weapons of mass destruction in non-orbital trajectories.⁷³⁹

A good deal has been written recently about a phenomenon termed the “revolution in military affairs” (RMA).⁷⁴⁰ Scholars are now debating whether such an event is occurring within the US military. If, as it appears, an RMA is occurring, many attribute it to a technological revolution creating breakthroughs in information and weapons systems. Within this revolution the prospect of space warfare looms large even as the contours of its legal scope remain unclear. As space threats emerge to challenge US dominance in the areas of civil, military, and commercial capabilities, the prospect of space warfare increases. To the extent the US maintains its military advantage, “the effect may be to so dominate an adversary before conflict starts as to make the conflict unnecessary. ...”⁷⁴¹ More likely than this optimistic assessment, however, is the possibility that the US will one day sustain an attack against one of its numerous space assets. Assuming this escalates into an armed conflict, the answer as to the legitimate response will come from the *jus in bello* for space – a body of law already in force to some small degree.⁷⁴²

More than half a century ago, Sir Hersch Lauterpacht pointed out that “[i]f international law is the weakest point of all law, then the law of war is virtually its vanishing point.”⁷⁴³ To be the “vanishing point” of international law (law of war) does not necessarily mean that such law is totally ignored by combatants. However, as far as the law of space warfare is concerned, despite nearly 40 years of research into space weaponry there is no binding international instrument limiting the use of such weapons. With two isolated examples, such weapons have not been fielded, contributing to State

⁷³⁹ Several of the items on these “prohibited” and “not prohibited” lists were taken from a July 1985 working paper entitled “Survey of International Law Relevant to Arms Control and Outer Space” submitted by the government of Canada to the U.N. Conference on Disarmament. Quoted in Stojak, *supra* note 439 at 45-46.

⁷⁴⁰ Such revolutions occur “whenever the nature of war and warfare fundamentally changes. . . .RMAs generate fundamental change in the normative architecture of war.” Schmitt, “Bellum Americanum,” *supra* note 6 at 394. Professor Schmitt goes on to provide as examples of previous RMAs, Napoleon’s use of the citizen-soldier in the 1790s, and the advent of nuclear weapons. *Ibid.*

⁷⁴¹ B.R. Schneider & L.E. Grinter, “Overview: New Era in Warfare? A Revolution in Military Affairs?” in Schneider, B.R. & Grinter, L.E., eds., *Battlefield of the Future: 21st Century Warfare Issues* (Maxwell AFB, AL: Air University Press, 1998) at 44.

⁷⁴² *Supra* note 623.

⁷⁴³ Quoted in Parks, *supra* note 201 at 2, n.5.

reluctance to foreclose further study into effective deterrents.⁷⁴⁴ However there will come a day when a treaty governing means and methods of space warfare will be desirable. In addition to the certainty written law brings to the legal structures governing human conduct, formal agreements most clearly evince the consent of the governed. Further, until and unless the community of nations produces a binding agreement stipulating various restrictions on space warfare, references to a legal "regime" governing space warfare may be unconvincing when compared with that governing other combat environments.⁷⁴⁵ Of course, any treaty developments for space warfare must strike a pragmatic balance between national security, international legal order, and human rights – a balance for which the *jus in bello* has striven for at least 100 years.

To a certain degree, this review of the law of war and its application to space warfare serves as a call for further analysis of the topic. Though armed conflict has not occurred in space to date, rudimentary means for engaging in such conflict now exists. As each armed conflict since Vietnam makes greater use of space assets, it is undoubtedly only a matter of time before a future conflict witnesses the application of force both from and within the space environment. When it does, and in the absence of specific international norms restricting the use of means of methods of war in space, State practice will provide the first insights into how the law will be applied.

As this review has argued, the lawful scope of such warfare will be limited by the customary principles of proportionality, necessity, discrimination, and humanity, and an array of treaty-based norms affecting the targeting of individuals and objects. To this extent the existing law of war restricts the scope of space warfare today. How the law will evolve into the "future" law of war will largely depend upon the nature and scope of such warfare, and upon the new customary principles that may emerge thereby. However, it is doubtful that the international community will have any greater success in codifying the law governing space warfare than it has had with respect to aerial warfare.

⁷⁴⁴ The exceptions being the US and Russian ASAT systems. States have historically been reluctant in agreeing to restrictions on their use of potential weaponry before it has been developed and fielded. The notable exception is the recent restriction on blinding lasers, see *supra* note 250.

⁷⁴⁵ Even reference to a "regime" for *aerial* warfare is somewhat suspect given the lack of specific treaty authority restricting its means and methods. What regime there is comes from diverse treaties and a loosely evolved consensus about customary international norms as expressed in State law of war manuals.

Selected Bibliography

I. International Treaties, Conventions, Agreements, and Other International Documents (listed chronologically)

A. Space and Related Treaties

- The Antarctic Treaty*, 1 December 1959, 402 U.N.T.S. 71 (entered into force 23 June 1961), reprinted in (1960) 54 A.J.I.L. 477.
- Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Underwater*, United States, United Kingdom and Soviet Union, 5 August 1963, 480 U.N.T.S. 43, 14 U.S.T. 1313 (entered into Force 10 October 1963, later joined by numerous additional states), reprinted in (1963) 2 I.L.M. 889.
- Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, 27 January 1967, 610 U.N.T.S. 205 18 U.S.T. 2410, T.I.A.S. No. 6347 (entered into Force 10 October 1967), reprinted in (1967) 6 I.L.M. 386.
- Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space*, 22 April 1968, 672 U.N.T.S. 119, 19 U.S.T. 7570, T.I.A.S. No. 6599 (entered into force 3 December 1968).
- Treaty on the Nonproliferation of Nuclear Weapons*, 1 July 1968, 729 U.N.T.S. 161, 21 U.S.T. 483 (entered into force 5 March 1970), reprinted in (1968) 7 I.L.M. 811.
- Agreement Relating to the International Telecommunications Satellite Organization "INTELSAT,"* 20 August 1971, 23 U.S.T. 3813, T.I.A.S. 7532 (entered into force 12 February 1973).
- Convention on International Liability for Damage Caused by Space Objects*, 29 March 1972, 961 U.N.T.S. 187, 24 U.S.T. 2389, T.I.A.S. No. 7762 (entered into force 1 September 1972).
- Treaty on the Limitation of Anti-Ballistic Missile Systems*, United States and Soviet Union, 26 May 1972, 23 U.S.T. 3435, T.I.A.S. 7503 (entered into force 3 October 1972; Protocol done 3 July 1974, entered into Force 24 May 1976).
- International Telecommunication Convention*, 25 October 1973, 28 U.S.T. 2495, T.I.A.S. No. 8572 (entered into force 10 January 1986; Annexes and Protocols, 6 November 1982).
- Convention on the Registration of Objects Launched into Outer Space*, 14 January 1975, 1023 U.N.T.S. 15, 28 U.S.T. 695, T.I.A.S. No. 8480 (entered Into Force 15 September 1979).
- Convention on the International Maritime Satellite Organization*, 3 September 1976, 1143 U.N.T.S. 105; 31 U.S.T. 1 (entered into force 16 July 1979).
- Agreement Governing the Activities of States on the Moon and Other Celestial Bodies*, 18 December 1979, 1363 U.N.T.S. 3; U.N. Doc. A/RES 34/68 (1979) reprinted in (1979) 18 I.L.M. 1434 (entered into force 11 July 1984).
- United Nations Convention on the Law of the Sea*, (1982) U.N. Doc. A/CONF.62/122, reprinted in (1982) 21 I.L.M. 1261 (entered into force 16 November 1994).
- Agreement Among the Government of Canada, Governments of Member States of the*

European Space Agency, The Government of Japan, the Government of the Russian Federation, And the Government of the United States of America Concerning the Cooperation on the Civil International Space Station, 29 January 1998, reprinted in S. Gorove, ed., *United States Space Law: National & International Regulation*, vol. IV (Dobbs Ferry, NY: Oceana Publications, Inc., May 1998) at 98-1 (not yet in force).

B. Law of Armed Conflict and Related Treaties

[For numerous additional treaties relating to the law of war beyond those referenced here, see Roberts & Guelff, *infra*, and Schindler & Toman, *infra*.]

Instructions for the Government of Armies of the United States in the Field, General Orders No. 100, 24 April 1863, reprinted in Schindler & Toman at 3.

Convention for the Amelioration of the Condition of the Wounded in Armies in the Field [Red Cross Convention], 22 August 1864, (1907 Supplement) 1 A.J.I.L. 90, reprinted in Schindler & Toman at 280.

Declaration of St. Petersburg Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight, 11 December 1868, (1907 Supplement) 1 A.J.I.L. 95, reprinted in Roberts & Guelff at 30, Schindler & Toman at 102.

Project of an International Declaration Concerning the Laws and Customs of War [Declaration of Brussels], 27 August 1874, reprinted in Schindler & Toman at 25.

Declaration (IV, 1) To Prohibit For the Term of Five Years the Launching of Projectiles and Explosives from Balloons, And Other Methods of a Similar Nature, 29 July 1899, (1907 Supplement) 1 A.J.I.L. 153 (entered into force 4 September 1900), reprinted in Schindler & Toman at 202.

Declaration (IV, 3) Concerning Expanding Bullets, 29 July 1899, (1907 Supplement) 1 A.J.I.L. 157 (entered into force 4 September 1900), reprinted in Roberts & Guelff at 40, Schindler & Toman at 109.

Convention (IV) Respecting the Laws and Customs of War on Land, 18 October 1907, (1908 Supplement) 2 A.J.I.L. 90 (entered into force 26 January 1910), reprinted in Roberts & Guelff at 44, Schindler & Toman at 69.

Convention (V) Respecting the Rights and Duties of Neutral Powers and Persons in Case of War on Land, 18 October 1907, (1908 Supplement) 2 A.J.I.L. 117 (Entered into force 26 January 1910), reprinted in Roberts & Guelff at 63, Schindler & Toman at 942.

Convention (IX) Concerning Bombardment by Naval Forces in Time of War, 18 October 1907, (1908 Supplement) 2 A.J.I.L. 146 (entered into force 26 January 1910), reprinted in Roberts & Guelff at 94, Schindler & Toman at 812.

Declaration (XIV) Prohibiting Discharge of Projectiles and Explosives From Balloons, 18 October 1907, (1908 Supplement) 2 A.J.I.L. 216 (entered into force 27 November 1909), reprinted in Schindler & Toman at 202.

Covenant of the League of Nations [Treaty of Versailles], 28 June 1919, 225 Consol. T.S. 188 (entered into force 10 January 1920).

Hague Rules of Aerial Warfare, 1923, (1923 Supplement) 17 A.J.I.L. 245 (not in force), reprinted in (1938 Supplement) 32 A.J.I.L. 12, Roberts & Guelff at 123, Schindler & Toman at 208.

(Geneva) Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or

- Other Gases, and of Bacteriological Methods of Warfare*, 17 June 1925, (1929) 94 L.N.T.S. 65, 26 U.S.T. 571, (1975) 14 I.L.M. 49, (1931 Supplement) 25 A.J.I.L. 94 (entered into force 8 February 1928), reprinted in Roberts & Guelff at 139, Schindler & Toman at 116.
- Treaty of Paris [Kellogg-Briand Pact]*, 1928, (1929) 94 L.N.T.S. 57.
- Charter of the United Nations*, 26 June 1945, Can. T.S. No. 7 (entered into force 24 October 1945).
- Geneva Convention (I) for the Amelioration of the Condition of Wounded and Sick in Armed Forces in the Field*, 12 August 1949, 75 U.N.T.S. 31, 6 U.S.T. 3114, T.I.A.S. 3362 (entered into force 21 October 1950), reprinted in Roberts & Guelff at 171, Schindler & Toman at 375.
- Geneva Convention (II) for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea*, 12 August 1949, 75 U.N.T.S. 85, 6 U.S.T. 3217, T.I.A.S. 3363 (entered into force 21 October 1950), reprinted in Roberts & Guelff at 194, Schindler & Toman at 403.
- Geneva Convention (III) Relative to the Treatment of Prisoners of War*, 12 August 1949, 75 U.N.T.S. 135, 6 U.S.T. 3316, T.I.A.S. 3364 (entered into force 21 October 1950), (1953 Supplement) 47 A.J.I.L. 119, reprinted in Roberts & Guelff at 216, Schindler & Toman at 429.
- Geneva Convention (IV) Relative to the Protection of Civilian Persons in Time of War*, 12 August 1949, 75 U.N.T.S. 287, 6 U.S.T. 3516, T.I.A.S. 3365 (entered into force 21 October 1950), (1956) 50 A.J.I.L. 724, reprinted in Roberts & Guelff at 272, Schindler & Toman at 501.
- Convention (and Regulations) for the Protection of Cultural Property in the Event of Armed Conflict*, 14 May 1954, 249 U.N.T.S. 240 (entered into force 7 August 1956), reprinted in Roberts & Guelff at 340, Schindler & Toman at 747.
- Protocol for the Protection of Cultural Property in the Event of Armed Conflict*, 14 May 1954, 249 U.N.T.S. 358 (entered into force 7 August 1956), reprinted in Roberts & Guelff at 263, Schindler & Toman at 777.
- Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction*, 10 April 1972, 1015 U.N.T.S. 164, 26 U.S.T. 583, (1972) 11 I.L.M. 309, (1972) 66 A.J.I.L. 451 (entered into force 26 March 1975), reprinted in Schindler & Toman at 137.
- Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques*, 18 May 1977, 1108 U.N.T.S. 151, 31 U.S.T. 333, T.I.A.S. 9614 (entered into force 5 October 1978), (1977) 16 I.L.M. 88, reprinted in Roberts & Guelff at 379, Schindler & Toman at 164.
- Protocol Additional to the Geneva Conventions of 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I)*, 8 June 1977, 1125 U.N.T.S. 3 (entered into force 7 December 1978), (1977) 16 I.L.M. 1391, (1978) 72 A.J.I.L. 457, reprinted in Roberts & Guelff at 389, Schindler & Toman at 627.
- Protocol Additional to the Geneva Conventions of 1949, and Relating to the Protection of Victims of Non-International Armed Conflicts (Protocol II)*, 8 June 1977, 1125 U.N.T.S. 609 (entered into force 7 December 1978), (1977) 16 I.L.M. 1442, (1978) 72 A.J.I.L. 457, reprinted in Roberts & Guelff at 449, Schindler & Toman at 691.
- Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons which May be Deemed to be Excessively Injurious or to Have Indiscriminate*

- Effects*, 10 October 1980, 1342 U.N.T.S. 7 (entered into force 2 December 1983), (1980) 19 I.L.M. 1523, reprinted in Roberts & Guelff at 473, Schindler & Toman at 179.
- Protocol [to the Convention on Conventional Weapons] on Non-Detectable Fragments (Protocol I)*, 10 April 1981, 1342 U.N.T.S. 7 (entered into force 2 December 1983), (1980) 19 I.L.M. 1523, reprinted in Roberts & Guelff at 479, Schindler & Toman at 185.
- Protocol [to the Convention on Conventional Weapons] on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devices (Protocol II)*, 10 April 1981, 1342 U.N.T.S. 7 (entered into force 2 December 1983), (1980) 19 I.L.M. 1529, reprinted in Roberts & Guelff at 479, Schindler & Toman at 188, amended 3 May 1996, (1996) 35 I.L.M. 1209.
- Protocol [to the Convention on Conventional Weapons] on Prohibitions or Restrictions on the Use of Incendiary Weapons (Protocol III)*, 10 April 1981, 1342 U.N.T.S. 7 (entered into force 2 December 1983), (1980) 19 I.L.M. 1529, reprinted in Roberts & Guelff at 484, Schindler & Toman at 190.
- Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction*, 13 January 1993, (1993) 32 I.L.M. 800.
- Protocol [to the Convention on Conventional Weapons] on Blinding Laser Weapons (Protocol IV)*, 13 October 1995, (1996) 35 I.L.M. 1218.
- Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction*, 18 September 1997, (1997) 36 I.L.M. 1507 (entered into force 1 March 1999).

C. Official International Documents

1. United Nations General Assembly Resolutions

- Declaration of Legal Principles Governing the Activities of States in the Exploration and Use of Outer Space*, 13 December 1963, G.A. Res. 1962 (XVIII), U.N. GAOR, 18th Sess. Supp. 15, U.N. Doc. A/5515 (1964) 15.
- Respect for Human Rights in Armed Conflicts*, 19 December 1968, G.A. Res. 2444 (XXIII), U.N. GAOR, 23rd Sess., Supp. No. 18, U.N. Doc. A/7218 (1969) 50; reprinted in Schindler & Toman at 263.
- Basic Principles for the Protection of Civilian Populations in Armed Conflicts*, 9 December 1970, G.A. Res. 2675 (XXV), U.N. GAOR, 25th Sess., Supp. No. 28, U.N. Doc. A/8028 (1971) 76; reprinted in Schindler & Toman at 267.
- Principles of International Law Concerning Friendly Relations and Cooperation Among States in Accordance with the Charter of the United Nations*, 24 October 1970, G.A. Res. 2625 (XXV), U.N. GAOR, 25th Sess., Supp. No. 28, U.N. Doc. A/8028 (1971); reprinted in (1971) 65 A.J.I.L. 243.
- Definition of Aggression*, 14 December 1974, G.A. Res. 3314 (XXIX), U.N. GAOR, 29th Sess., Supp. No. 31, U.N. Doc. A/9631 (1975) 142; reprinted in (1975) 69 A.J.I.L. 480.
- Principles Relating to Remote Sensing of the Earth From Outer Space*, 3 December 1986, U.N. Doc. A/Res/41/65.

Principles Relating to the Use of Nuclear Power Sources in Outer Space, 14 December 1992, U.N. Doc. A/Res/47/68.

Protection of the Environment in Times of Armed Conflict, G.A. Res. 47/37, U.N. EAOR, 47th Sess., Supp. No. 49, U.N. Doc. A/47/49 (1992).

Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interests of All States, Taking Into Particular Account the Needs of Developing Countries, 13 December 1996, U.N. Doc. A/Res/51/122.

2. International Court of Justice/Permanent Court of International Justice

Steamship Lotus Case (France v. Turkey) [1927] P.C.I.J. Series A, No.10.

North Sea Continental Shelf Cases (Germany v. Denmark; German v. The Netherlands) [1969] I.C.J. Rep. 4.

Case Concerning Military and Paramilitary Activities in and against Nicaragua, Merits (Nicaragua v. United States) [1986] I.C.J. Rep. 14.

Legality of the Use By a State of Nuclear Weapons in Armed Conflict, Advisory Opinion [1996] I.C.J. Rep. 4.

II. Books, Reports, and Dissertations

A. Public International Law, Space Law & Military Use of Space

Alves, P.G., *Prevention of an Arms Race in Outer Space: A Guide to the Discussions in the Conference on Disarmament* (New York: United Nations, 1991).

Andem, M.N., *International Legal Problems in the Peaceful Exploration and Use of Outer Space* (Rovaniemi, Finland: University of Lapland Publications, 1992).

Benko, M. & Schrogl, K.U., eds., *International Space Law in the Making* (Gif-sur-Yvette, France: Editions Frontières, 1993).

Bernhardt, ed., *Encyclopedia of Public International Law*, vols. 3 & 4, Use of Force, War and Neutrality, Peace Treaties (Amsterdam: North-Holland Publishing Company, 1982).

Böckstiegel, K.H. & Benkö, M., eds., *Space Law: Basic Legal Documents*, 4 vol. (The Hague: Martinus Nijhoff Publishers, 1996).

_____, ed., *Manned Space Flight: Legal Aspects in the Light of Scientific and Technical Development* (Köln: Carl Heymanns Verlag, 1993).

Boyne, W.J., *Beyond the Wild Blue: A History of the U.S. Air Force* (New York: St. Martin's Griffin, 1998).

Burrows, W., *This New Ocean: The Story of the First Space Age* (New York: Random House, 1998).

Cheng, B., *Studies in International Space Law* (Oxford: Clarendon Press, 1997).

Christol, C.Q., *Space Law: Past, Present, and Future* (Deventer, The Netherlands: Kluwer Law and Taxation Publishers, 1991).

_____, *The Modern International Law of Outer Space* (New York: Pergamon Press 1982).

Clark, P., ed., *Jane's Space Directory*, 13th ed., 1997-1998 (Surrey, England: Jane's

- Information Group, 1997).
- Cohen, ed., *Law and Politics in Space: Proceedings of the 1st McGill Conference on the Law of Outer Space, 12-13 April 1963* (Montreal: McGill University Press, 1964).
- Collins, J.M., *Military Space Forces: The Next 50 Years* (Washington: Pergamon-Brassey's International Defense Publishers, Inc., 1989).
- Collins, M., *Liftoff: The Story of America's Adventure in Space* (New York: Grove Press, 1988).
- Diederiks-Verschoor, I.H.Ph., *An Introduction to Space Law* (Deventer, The Netherlands: Kluwer Law and Taxation Publishers, 1993).
- Doyle, S.E., *Civil Space Systems: Implications for International Security* (Aldershot, UK: Dartmouth Publishing Company, 1994).
- Durch, W.J., *National Interests and the Military Use of Space* (Cambridge, MA: Ballinger Publishing Company, 1984).
- Dutton, deGaris, Winterton & Harding, eds., *Military Space* (London: Brassey's, 1990).
- Fawcett, J.E.S., *International Law and the Uses of Outer Space* (Manchester: Manchester University Press, 1968).
- Goldman, N.C., *American Space Law: International and Domestic* (San Diego, CA: Univelt, 1996).
- _____, *Space Policy: An Introduction* (Ames: Iowa State University Press, 1992).
- Gorove, S., ed., *United States Space Law: National & International Regulation*, 5 vol. (Dobbs Ferry, NY: Oceana Publications, 1999).
- Gorove, S., *Developments in Space Law: Issues and Policies* (Dordrecht: Martinus Nijhoff Publishers, 1991).
- Grabbe, C.L., *Space Weapons and the Strategic Defense Initiative* (Ames: Iowa State University Press, 1991).
- Graham, D.O., *High Frontier: A New National Strategy* (Washington, DC: High Frontiers Incorporated, 1982).
- Gray, C., *American Military Space Policy: Information Systems, Weapon Systems and Arms Control* (Cambridge, MA: Abt Books, 1982).
- Hall, R.C. & Neufeld, J., eds., *The U.S. Air Force in Space 1945 to the Twenty-first Century: Proceedings of the Air Force Historical Foundation Symposium, 21-22 September 1995* (Washington, DC: USAF History and Museums Program, 1998).
- Handberg, R., *The Future of the Space Industry* (Westport, CT: Quorum Books, 1995).
- Harris, D.J., *Cases and Materials on International Law*, 5th Ed. (London: Sweet and Maxwell, 1998).
- Hurwitz, B.A., *The Legality of Space Militarization* (Amsterdam: North-Holland, 1986).
- Jasani, B., ed., *Peaceful and Non-Peaceful Uses of Space: Problems of Definition for the Prevention of an Arms Race* (New York: Taylor & Francis, 1991).
- _____, ed., *Space Weapons and International Security* (New York: Oxford University Press, 1987).
- _____, ed., *Outer Space – A New Dimension of the Arms Race* (London: Taylor & Francis, 1982).
- Jasani, B. & Lee, C., *Countdown to Space War* (New York: Taylor & Francis, 1984).
- Jasentuliyana, N., ed., *Space Law: Development and Scope* (Westport, CT: Praeger Publishing, 1992).
- Jasentuliyana, N. & Lee, R.S.K., eds., *Manual on Space Law*, 4 Vol. (Dobbs Ferry, NY: Oceana Publications, Inc., 1979-1981).

- Joyner, C.C., ed., *The United Nations and International Law* (Washington, DC & Cambridge, UK: American Society of International Law & Cambridge University Press, 1997).
- Johnson, D.J., Pace, S. & Gabbard, C.B., *Space: Emerging Options for National Power* (Washington DC: RAND National Defense Research Institute, 1998).
- Johnson, D.J. & Reynolds, K., *Spacepower for a New Millenium: Space and U.S. National Security* (Colorado Springs: U.S. Air Force Academy, 1998).
- Kish, J., *The Law of International Spaces* (Leiden: A.W. Sijthoff International Publishing Co., 1973).
- Klass, *Secret Sentries in Space* (New York: Random House, 1971).
- Lachs, M., *The Law of Outer Space: An Experience in Contemporary Law-Making* (Amsterdam: A.W. Sijthoff, 1972).
- Lafferranderie, G. & Crowther D., Eds., *Outlook on Space Law over the Next 30 Years: Essays Published for the 30th Anniversary of the Outer Space Treaty* (The Hague: Kluwer, 1997).
- Li, K.L., *World-Wide Space Law Bibliography* (Montreal: De Daro Publishing, vol. I-1978; vol. II-1987; update-1998).
- Luongo, K.N. & Wander, W.T., eds., *The Search for Security in Space* (Ithaca, NY: Cornell University Press, 1989).
- Malanczuk, P., *Akehurst's Modern Introduction to International Law*, 7th Rev. Ed. (London: Routledge, 1997).
- Mani, V.S., Bhatt S. & Reddy, V.B., eds., *Recent Trends in International Space Law and Policy* (New Delhi, India: Lancers Books, 1997).
- Mantz, M.R., *The New Sword: A Theory of Space Combat Power* (Maxwell AFB, AL: Air University Press, 1995).
- Matte, N.M., ed., *Arms Control and Disarmament in Outer Space: Toward a New Order of Survival*, vol. IV (Montreal: McGill Center for Research in Air and Space Law 1991).
- _____, ed., *Space Without Weapon: Proceedings of the Symposium Held on 25-27 Oct 89* (Montreal: McGill Centre for Research of Air and Space Law, 1989).
- _____, ed., *Arms Control and Disarmament in Outer Space: Toward Open Skies*, vol. III (Montreal: McGill Center for Research in Air and Space Law, 1989).
- _____, ed., *Space Surveillance For Arms Control and Verification – Options: Proceedings of the Symposium Held on 21-23 Oct 87* (Montreal: McGill Centre for Research of Air and Space Law, 1987).
- _____, ed., *Arms Control and Disarmament in Outer Space*, vol. II (Montreal: McGill Center for Research in Air and Space Law, 1987).
- _____, ed., *An Arms Race in Outer Space: Could Treaties Prevent it?* (Montreal: McGill Centre for Research of Air and Space Law, 1985).
- _____, ed., *Space Activities and Emerging International Law* (Montreal: McGill University Press, 1984).
- _____, *Treatise on Air-Aeronautical Law* (Montreal/Toronto: McGill Centre for Research of Air and Space Law/The Carswell Company Limited, 1981).
- McDougal, M.S., Laswell, H.D. & Vlasic, I.A., *Law and Public Order in Space* (New Haven, CT: Yale University Press, 1963).
- Muolo, M.J., et al., eds., *Space Handbook: A War Fighter's Guide to Space*, vol. 1 (Maxwell AFB, AL: Air University Press, 1993).

- _____, *Space Handbook: An Analyst's Guide*, vol. 2 (Maxwell AFB, AL: Air University Press, 1993).
- Newberry, R.D., *Space Doctrine for the Twenty-first Century* (Maxwell AFB, AL: Air University Press, 1998).
- Nye, J.S., Jr. & Schear, J.A., eds., *Seeking Stability in Space: Anti-Satellite Weapons and the Evolving Space Regime* (Aspen Strategy Group & University Press, 1987).
- Ogunbanwo, O.O., *International Law and Outer Space Activities* (The Hague: Martinus Nijhoff, 1975).
- Petersen, S.R., *Space Control and the Role of Antisatellite Weapons* (Maxwell AFB, AL: Air University Press, 1991).
- Preston, B., *Plowshares and Power: The Military Use of Civil Space* (Washington, DC: National Defense University Press, 1992).
- Reijnen, B., *The United Nations Space Treaties Analyzed* (Gif-sur-Yvette Cedex, France: Editions Frontières, 1992).
- Reynolds, G. & Merges, R., *Outer Space: Problems of Law and Policy*, 2nd ed. (Boulder, CO: Westview Press, 1997).
- Robinson, G.S. & White, H.M., Jr., *Envoys of Mankind: A Declaration of First Principles for the Governance of Space Societies* (Washington, D.C.: Smithsonian Institution Press, 1986).
- Salkeld, Robert, *War and Space* (Englewood Cliffs, NJ: Prentice-Hall, 1970).
- Schneider, B.R. & Grinter, L.E., *Battlefield of the Future: 21st Century Warfare Issues* (Maxwell AFB, AL: Air University Press, 1998).
- Simma, B., et al., eds., *The Charter of the United Nations: A Commentary* (Oxford, UK: Oxford University Press, 1994).
- Stares, P., *Space and National Security* (Washington, DC: Brookings Institution, 1987).
- _____, *The Militarization of Space – U.S. Policy, 1945-1984* (Ithaca, NY: Cornell University Press, 1985).
- Stockholm International Peace Research Institute, *Outer Space – Battlefield of the Future?* (New York: Taylor & Francis, 1978).
- United Nations, *Space Activities of the United Nations and International Organizations* (New York: United Nations Publications, 1992).
- United States Congress, *Anti-Satellite Weapons, Countermeasures, and Arms Control* (Washington, DC: Office of Technology Assessment, 1985).
- United States Air Force Scientific Advisory Board, *New World Vistas: Air and Space Power for the 21st Century*, 14 vol. (Washington, DC: Department of the Air Force, December 1995).
- Vazquez, M.S., *Cosmic International Law*, trans. Malley, E. (Detroit, MI: Wayne State University Press, 1965).
- Vlasic, I.A., ed., *Space Law and Institutions: Documents and Materials* (Montreal: McGill University, 1997).
- _____, ed., *Explorations in Aerospace Law*, (Montreal: McGill University Press, 1968).
- Wassenbergh, H., *Principles of Outer Space Law in Hindsight* (Dordrecht: Martinus Nijhoff, 1991).
- Wilson, A., *Jane's Space Directory*, 14th ed. (London: Jane's Information Group, 1998).
- Ziegler, D.W., *Safe Heavens: Military Strategy and Space Sanctuary Thought* (Montgomery, AL: Air University Press, 1998).

B. Law of Armed Conflict, Military Law, & Warfare

- Barnett, J.R., *Future War: An Assessment of Aerospace Campaigns in 2010* (Montgomery, AL: Air University Press, 1996).
- Bothe, M., Partsch, K.J. & Solf, W.A., *New Rules for Victims of Armed Conflicts: Commentary on the Two 1977 Protocols Additional to the Geneva Conventions of 1949* (The Hague: Martinus Nijhoff Publishers, 1982).
- Brownlie, I., *International Law and the Use of Force by States* (Oxford, UK: Clarendon Press, 1963).
- Clausewitz, K.V., *On War*, trans. & eds., M. Howard & P. Paret (Princeton, NJ: Princeton University Press, 1976).
- Cohen, M., Nagel, T. & Scanlon, T., eds., *War and Moral Responsibility* (Princeton, NJ: Princeton University Press, 1974).
- Danchev, A. & Keohane, D., *International Perspectives on the Gulf Conflict, 1990-91* (New York: St. Martin's Press, 1994).
- DeLupis, I.D., *The Law of war* (Cambridge: Cambridge University Press, 1987).
- DeMulinen, F., *Handbook on the Law of war For Armed Forces* (Geneva: International Committee of the Red Cross, 1987).
- Dinstein, Y., *War, Aggression and Self-Defence*, 2d ed. (Cambridge, UK: Cambridge University Press, 1994).
- Fleck, D., ed., *The Handbook of Humanitarian Law in Armed Conflicts* (Oxford UK, Oxford University Press, 1995).
- Friedman, L., ed., *The Law of war: A Documentary History*, 2 Vol. (New York: Random House, 1972).
- Friedman, G. & Friedman, F., *The Future of War: Power, Technology and American World Dominance in the 21st Century* (New York: St. Martin's Press, 1998).
- Green, L.C., *The Contemporary Law of Armed Conflict*, rev'd ed. (Manchester, UK: Manchester University Press, 1999).
- _____, *Essays on the Modern Law of war*, 2d. ed. (Dobbs Ferry, NY: Transnational Publishers, Inc., 1999).
- Howard, M., et al., eds., *The Laws of War: Constraints on Warfare in the Western World* (New Haven, CT: Yale University Press, 1994).
- Kalshoven, F., *The Law of warfare: A Summary of its Recent History and Trends in Development* (Leyden: A.W. Sijthoff, 1973).
- Keegan, J., *A History of Warfare* (New York: Alfred A. Knopf, 1994).
- Keijzer, N., *Military Obedience* (Sijthoff & Noordhoff, 1978).
- Kwakwa, E.K., *The International Law of Armed Conflict: Personal and Material Field of Application* (Dordrecht: Nijhoff, 1992).
- Levie, H.S., *The Law of war and Neutrality: A Selective English-Language Bibliography* (Dobbs Ferry, New York: Oceana Publications, Inc., 1988).
- _____, *The Code of International Armed Conflict* (London: Oceana Publications, Inc., 1986).
- McCoubrey, H., *International Humanitarian Law: Modern Developments in the Limitation of Warfare*, 2nd ed. (Aldershot, UK: Dartmouth Publishing Company, 1999).
- McCoubrey, H. & White, *International Law and Armed Conflict* (Stuttgart: F. Steiner,

- 1992).
- McDougal, M.S. & Feliciano, F.P., *The International Law of war: Transnational Coercion and World Public Order* (The Hague: Martinus Nijhoff, 1994).
- _____, *Law and Minimum World Public Order* (New Haven: Yale University Press, 1961).
- Molander, R.C., Wilson, P.A., Mussington, D.A. & Mesic, R.F., *Strategic Information Warfare Rising* (Washington, DC: RAND National Defense Research Institute, 1998).
- Powers, T. & Tremain R., eds., *Total War: What it is, How it Got That Way* (New York: William Morrow & Company, Inc., 1988).
- Reisman, W.M. & Antoniou, C.T., *The Laws of War: A Comprehensive Collection of Primary Documents on International Laws Governing Armed Conflict* (New York: Vintage Books, 1994).
- Roberts, A. & Guelff, R., eds., *Documents on the Laws of War*, 2nd ed. (Oxford UK, Oxford University Press, 1989).
- Rogers, A.P.V., *Law on the Battlefield* (Manchester, UK: Manchester University Press, 1996).
- Schindler, D. & Toman, J., eds., *The Laws of Armed Conflicts: A Collection of Conventions, Resolutions and Other Documents*, 2nd ed. (Dordrecht: Martinus Nijhoff, 1988).
- Shukman, D., *Tomorrow's War: The Threat of High-Technology Weapons* (New York: Harcourt Brace & Company, 1996).
- Spaight, J.M., *Air Power and War Rights*, 3rd ed. (London: Longmans, Green & Co., 1947).
- Sun Tzu, *The Art of War* [500 B.C.], trans. Griffith, S.B. (Oxford: Oxford University Press, 1971).
- Wright, Q., *A Study of War*, 2nd ed. (Chicago: University of Chicago Press, 1965).

III. Journal Articles, Essays, Selections from Books & Conference Proceedings

A. Space Law, Information Warfare & Related Military Topics

- Aldrich, R.W., "The International Legal Implications of Information Warfare" (1996) 10:3 *Airpower J.* 99.
- Andem, M.N., "Implementation of Article IV of the Outer Space Treaty of 1967 During the 21st Century" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 338.
- Baum, M.E., "Defiling the Altar: The Weaponization of Space" (1994) 8 *Airpower Journal* 52.
- Bruger, S.J., "Not Ready for the First Space War – What About the Second?" (1995) 48:1 *Naval War College Review* 73.
- Cheng, B., "Article VI of the 1967 Space Treaty Revisited: 'International Responsibility,' 'National Activities,' and 'The Appropriate State'" (1998) 26:1 *J. of Space L.* 7.
- _____, "'Space Objects,' 'Astronauts,' and Related Expressions" in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1992) 17.

- Christol, C.Q., "Important Concepts for the International Law of Outer Space" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 73.
- _____, "Space Debris and Military Testing" in *Proceedings of the Thirty-First Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1989) 234.
- _____, "Article 2 of the 1967 Principles Treaty Revisited" (1984) IX Ann. Air & Space L. 217.
- Cocca, A.A., "Prospective Space Law" (1998) 26:1 J. of Space L. 51.
- DeCocca, M., "Protocols to the Space Treaty" in *Proceedings of the Thirty-Eighth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1996) 229.
- DeBlois, B.M., "Space Sanctuary: A Viable National Strategy" (1998) 12:4 Airpower Journal 41.
- _____, "Ascendant Realms: Characteristics of Airpower and Space Power" in Meilinger, P.S., ed., *The Paths of Heaven: The Evolution of Airpower Theory* (Maxwell AFB, AL: Air University Press, School of Advanced Airpower Studies, 1997) 529.
- Doyle, S.E., "Concepts of Space Law Before Sputnik" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 3.
- _____, "Implications of Civil Space Systems for Military Security" in Doyle, S.E., *Civil Space Systems: Implications for International Security* (Aldershot, UK: Dartmouth Publishing Company, 1994) 81.
- Eichelberger, K.L., "A New Duel: Antisatellite Combat in Space" (May 1982) 35 Naval War College Review 41.
- Filho, J.M., "Total Militarization of Space and Space Law: The Future of the [sic] Article IV of the 67' Outer Space Treaty" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 358.
- _____, "The Place of the Missile Technology Control Regime (MTCR) in International Space Law" in *Proceedings of the Thirty-Sixth Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1994) 89.
- Gál, G., "Air Crew and Space Crew: Comparative Observations De Lege Ferenda" in *Proceedings of the Thirty-Sixth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1994) 272.
- _____, "Space Weapons – Problems of Interpretation" in *Proceedings of the Thirty-First Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1989) 349.
- Galloway, E., "The United States and the 1967 Treaty on Outer Space" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 18.
- _____, "Expanding Space Law into the 21st Century" in *Proceedings of the Thirty-Fifth Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1993) 49.
- Garcia, J.C., "Heaven or Hell: The Future of the United States Launch Services Industry" (1994) 7 Harv. J. Law & Tec. 333.
- Goldman, N.C. & O'Donnell, D.J., "Revisiting the Outer Space Treaty: A Re-Examination of the Sovereignty-Jurisdiction Compromise" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 316.
- Gorove, S., "Legal and Policy Issues Raised by the Proposed Notion of 'Aerospace Object'" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 411.
- Gray, C., "The Influence of Space Power Upon History" (1996) 15 Comparative Strategy

- 293.
- _____, "Space Power Survivability" (1993) 7:3 *Airpower J.* 27.
- Haeck, L., "Disarmament Law and International Order in Outer Space" (1997) XXII-I *Annals of Air and Space Law* 559.
- Hansen, R.E., "Can the United States Afford to Surrender in the Next Conflict to Another Nation's Dominance in Space?" (1998) 12:3 *Airpower J.* 107.
- Hashimoto, Y., "Legal Analysis of Military Observation from Outer Space" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 229.
- _____, "The Status of Astronauts Toward the Second Generation of Space Law" in *Proceedings of the Thirty-Sixth Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1994) 206.
- Heere, W.P., "Problems of Jurisdiction in Air and Outer Space" (April 1999) XXIV:2 *Air & Sp. L.* 70.
- Jenson, O.E., "Information Warfare: Principles of Third-Wave War" (1994) 8:4 *Airpower Journal* 35.
- Johnson, D., "The Impact of International Law and Treaty Obligations on United States Military Operations in Space" (1989) 3:33 *High Tech. L. J.* 33.
- Justin, J.E., "Space: A Sanctuary, the High Ground, or a Military Theater" in Ra'anani U. & Pfaltzgraff, R.L., Jr., eds. *International Security Dimensions of Space* (Hamden, CT: Archon Books, 1984) 102.
- Kagan, F.W., "Star Wars in Real Life: Political Limitations on Space Warfare" (Autumn 1998) *Parameters* 112.
- Kamenetskaya, E., "Outer Space and the Term 'Militarization'" in *Proceedings of the Thirty-Third Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1991) 224.
- _____, "'Cosmonaut' ('Astronaut'): An Attempt of International Legal Definition" in *Proceedings of the Thirty-First Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1989) 177.
- Kelly, J.W., "Space is More Than a Place" (1996) 10 *Airpower J.* 97.
- Kopal, V., "Some Remarks on Issues Relating to Legal Definitions of 'Space Object,' 'Space Debris,' and 'Astronaut'" in *Proceedings of the Thirty-Seventh Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1995) 99.
- Kuskuvelis, I.I., "Satellites for War and Peace" in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1992) 227.
- Lambeth, B.S., "The Synergy of Air and Space" (1998) 12:2 *Airpower J.* 4.
- Lupton, D., "Space Doctrines" (1983) *Strategic Review* 36.
- Malenovsky, J., "Antarctic Treaty System – A Suitable Model for the Further Development of Space Law" in *Proceedings of the Thirty-First Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1989) 312.
- Matte, M.M., "Space Militarization and Space Law at a Time of 'Non-Peaceful Coexistence'" (1984) IX *Ann. Air & Sp. L.* 355.
- McDougal, M., & Lipson, L., "Perspectives for a Law of Outer Space" (1958) 52 *A.J.I.L.* 407.
- Moorman, T.S., "The Explosion of Commercial Space and the Implications for National Security" (1999) 13:1 *Airpower J.* 1.
- _____, "Space: A New Strategic Frontier" (1992) 6:1 *Airpower J.* 14.

- Morgan, R.A., "Military Use of Commercial Communication Satellites: A New Look At the Outer Space Treaty and 'Peaceful Purposes'" (1994) 60 J. Air L. & Com. 237.
- Noyes, H.F., III, "Air and Space Forces: The One Endures as the Other Emerges" (1990) 4:1 Airpower J. 62.
- O'Donnell, D. & Goldman, N.C., "Astro Law as Lex Communis Spatialis" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 322.
- Potter, M., "Gun Launch to Space: International Policy and Legal Considerations" in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1992) 304.
- Reibel, D.E., "Space Commerce in the Context of Military Power: Maintaining Outer Space for Peaceful Purposes?" in *Proceedings of the Thirty-Third Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1991) 62.
- Schwetje, F.K., "U.S. Legislation to Implement the Missile Technology Control Regime" in *Proceedings of the Thirty-Fourth Colloquium on the Law of Outer Space* (Washington, DC: AIAA, 1992) 321.
- Scoville, H., Jr. & Tsipis, K., "Can Space Remain a Peaceful Environment?" Occasional Paper 18 (Muscatine, IA: The Stanley Foundation, 1978).
- Siddiqi, A.A., "Cold War in Space: A Look Back at the Soviet Union" (1998) 40 Spaceflight 63.
- Smith, B., "The Challenge of Space Power" (1999) 13:1 Airpower J. 32.
- Stojak, M.L., "Recent Developments in Space Law" (Proceedings of the Fifteenth Annual Ottawa NACD Verification Symposium, Montebello, Quebec, 11-14 March 1998) in Beier, J.M. & Majajja, S., eds., *Arms Control and the Rule of Law: A Framework for Peace and Security in Outer Space* (Toronto: Centre for International and Security Studies, York University, 1998).
- Terekhov, A.D., "UNGA Resolutions and Outer Space Law" in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1998) 97.
- _____, "Passage of Space Objects Through Foreign Airspace: International Custom?" (1997) 25:1 J. of Space L. 1.
- Thomson, A., "Satellite Vulnerability: A Post-Cold War Issue?" (1995) 11:1 S. Pol. 19.
- Vlasic, I.A., "A Survey of the Space Law Treaties and Principles Developed Through the United Nations" in *Proceedings of the Thirty-Eighth Colloquium on the Law of Outer Space* (Reston, VA: AIAA, 1996) 324.
- _____, "Space Law and the Military Applications of Space Technology" in N. Jasentuliyana, ed., *Perspectives on International Law* (London: Kluwer Law International, 1995).
- Von der Dunk, F., "The Role of Law with Respect to Future Space Activities" (February 1996) Space Policy 5.
- Von Noorden, W.D., "TNMARSAT Use by Armed Forces: A Question of Treaty Interpretation" (1995) 23:1 J. of Space L. 1.
- Williams, C.D., "Space: The Cluttered Frontier" (1995) 60 J. Air L. & Com. 1139.

B. Law of Armed Conflict & Related Military Topics

- Aldrich, G.H., "Prospects for U.S. Ratification of Protocol I" (1991) 85:1 Am. J. Int. L. 1.

- Anderson, D.S., "A Military Look Into Space: The Ultimate High Ground" 1995 Army Law. 19.
- Astley, J. & Schmitt, M.N., "The Law of the Sea and Naval Operations" (1997) 42 A.F.L.R. 119.
- Bourbonniere, M. & Haack L., "Jus in Bello Spatialis" (Conference on Space Manufacturing, Proceedings of the Space Studies Institute, Princeton University, 7 May 1999).
- Cameron, P.J., "The Limitations on Methods and Means of Warfare" 9 Austr. Y. Int'l L. (Canberra: Australian National University, 1985) 247.
- Carnahan, B.M., "Lincoln, Lieber and the Laws of War: The Origins and Limits of the Principle of Military Necessity" (1998) 92:2 Am. J. Int. L. 213.
- _____, "Unnecessary Suffering, the Red Cross and Tactical Laser Weapons" (1996) 18 Loy. L.A. Int'l & Comp. L.J. 705.
- _____, "Additional Protocol I: A Military View" (1986) [vol.] Akron L. Rev. [page].
- _____, "Protecting Civilians Under the Draft Geneva Protocol" (1976) 18:4 Air Force L. Rev. 32.
- _____, "The Law of Aerial Bombardment in Its Historical Context" (1975) 17:2 Air Force L. Rev. 39.
- Colby, E., "The Military Value of the Laws of War" (1926-27) 15 Geo. L.J. 24.
- DeSaussure, A.L., "The Role of the Law of Armed Conflict During the Persian Gulf War: An Overview" (1994) 37 A.F.L. Rev. 41.
- DeSaussure, H., "The Laws of Air Warfare: Are There Any?" (1975) Mich. L. Rev. (Bicent. Issue) 287.
- Dunlap, C.J., "A Virtuous Warrior in a Savage World" (1997/1998) 8 USAFA J. L. Studies 71.
- _____, "How We Lost the High-Tech War of 2007: A Warning From the Future" (29 January 1996) *The Weekly Standard* 22.
- Green, L.C., "Nuclear Weapons and the Law of Armed Conflict" (1988) 17 Denver J. of Int. L. and Policy 1.
- _____, "Lawful and Unlawful Weapons and Activities" in Green, L.C., *Essays on the Modern Law of war* (Dobbs Ferry, NY: Transnational Publishers, 1985) 151.
- _____, "The New Law of Armed Conflict" (1977) 15 Canadian Yearbook of Int. L. 3.
- Greenwood, C., "The Concept of War in Modern International Law" (1987) 36 Int. & Comparative L. Q. 283.
- Grieg, D.W., "The Underlying Principles of International Humanitarian Law" 9 Austr. Y. Int'l L. (Canberra: Australian National University, 1985) 46.
- Henry, R. & Peartree, C.E., "Military Theory and Information Warfare" (Autumn 1998) Parameters 121.
- Jochnick, C. & Normand, R., "The Legitimation [sic] of Violence: A Critical History of the Gulf War" (1994) 35:2 Harv. Int. L. J. 387.
- _____, "The Legitimation [sic] of Violence: A Critical History of the Laws of War" (1994) 35:1 Harv. Int. L. J. 49.
- Kunich, J.C., "Planetary Defense: The Legality of Global Survival" (1997) 41 A.F.L. Rev. 119.
- Kwakwa, E., "The Current Status of Mercenaries in the Law of Armed Conflict" (1990) 14 Hastings Int'l & Comp. L. Rev. 67.

- Lachs, M., "The Unwritten Laws of War" (1945) 20:1 Tul. L. Rev. 120.
- Lauterpacht, H., "Rules of Warfare in an Unlawful War" in Lipsky, G.A., ed. *Law and Politics in the World Community* (Berkley, University of California Press, 1953).
- Lepper, S.J., "On (The Law of) War: What Clausewitz Meant to Say" (1998) National War College.
- Levie, H.S., "Some Major Inadequacies in the Existing Law Relating to the Protection of Individuals During Armed Conflict" in Carey, J., ed., *When Battle Rages, How Can Law Protect?* (Dobbs Ferry, NY: Oceana Publications, Inc., 1971) 1.
- McCall, J.H., "Blinded by the Light: International Law and the Legality of Anti-Optic Laser Weapons" (1997) 30 Cornell Int'l L. J. 1.
- McDonald, G.K., "The Eleventh Annual Waldemar A. Solf Lecture: The Changing Nature of the Laws of War" (1998) 156 M. L. Rev. 30.
- Morris, S.R., "The Laws of War: Rules by Warriors for Warriors" 1997 Army Law. 4.
- Neff, S.C., "Towards a Law of Unarmed Conflict: A Proposal for a New International Law of Hostility" (1995) 28 Cornell Int'l L. J. 1.
- Parkerson, J.E., "International Legal Implications of the Strategic Defense Initiative" (1987) 116 Mil. L. Rev. 67.
- Parks, W.H., "Air War and the Law of war" (1990) 32 A.F.L. Rev. 1.
- Paust, J.J., "Controlling Prohibited Weapons and the Illegal Use of Permitted Weapons" (1983) 28 McGill L. J. 609.
- Provost, R., "Reciprocity in Human Rights and Humanitarian Law" (1994) 65 B.Y.I.L (Oxford, UK: Clarendon Press, 1995) 383.
- Reisman, W.M. & Leitzau, W.K., "Moving International Law from Theory to Practice: the Role of Military Manuals in Effectuating the Law of Armed Conflict" in Robertson, H.B., Jr., ed., *The Law of Naval Operations*, International Law Studies, vol. 64 (Newport, RI: Naval War College, 1991) 1.
- Roberts, A., "The Laws of War: Problems of Implementation in Contemporary Conflicts" (1995) 6:1 Duke J. Comp. & Int'l L. 11.
- Robertson, H.B., Jr., "The Principle of the Military Objective in the Law of Armed Conflict" (1997/1998) 8 USAFA J. of Legal Studies 35.
- Rodgers, W.L., "Future International Laws of War" (1939) 33:3 Am. J. Int. L. 441.
- Röling, B.V.A., "The Significance of the Laws of War" in Cassese, A., ed., *Current Problems in International Law: Essays on U.N. Law and on the Law of Armed Conflict* (Milan: Dott. A. Giuffrè Editore, 1975) 133.
- Sadurska, R., "Threats of Force" (1988) 82:2 Am. J. I. L. 239.
- Schmitt, M., "Bellum Americanum: The U.S. View of Twenty-First-Century War and its Possible Implications for the Law of Armed Conflict" in Schmitt, M. & Green, L.C., eds., *The Law of Armed Conflict: Into the Next Millenium*, vol. 71, International Law Studies (Newport, RI: Naval War College Press, 1998) 389; reprinted in ___, "Green War: An Assessment of the Environmental Law of International Armed Conflict" (1997) 22:1 Yale J. Int'l L. 1.
- Sharp, W.G., "The Effective Deterrence of Environmental Damage During Armed Conflict: A Case Analysis of the Persian Gulf War" (1992) 137 Mil. L. Rev. 1.
- Sofaer, A.D., "The U.S. Decision Not to Ratify Protocol I to the Geneva Conventions on the Protection of War Victims" (1988) 82:4 Am. J. I. L. 784.
- Stein, G.J., "Information Warfare" (1995) 9:1 Airpower J. 30.
- Strong, J.M., "Blinding Laser Weapons and Protocol IV: Obscuring the Humanitarian

- Vision" (1996) 15 Dick. J. Int'l L. 237.
- Turley, S.L., "Keeping the Peace: Do the Laws of War Apply?" (1994) 73:1 Tex. L. Rev. 139.
- Verplaetse, J.G., "The Law of war and Neutrality in Outer Space" (1959) 29 Nordisk Tidsskrift for International Ret 49.
- Whitaker, R.M., "Civilian Protection Law in Military Operations: An Essay" 1996 Army Law. 3.

IV. News and Magazine Reports

- Anselmo, J., "Industry Impacts U.S. Space Policy" (6 July 1998) 149:1 AW&ST 34.
- _____, "U.S. Seen More Vulnerable to Electromagnetic Attack" (28 July 1997) 147:4 AW&ST 67.
- _____, "New Funding Spurs Space Laser Efforts" (14 October 1996) 145:16 AW&ST 67.
- Atkinson, D., "AF Officials: Space Weapons a Matter of Time, Technology, Policy" (30 November 1998) 200 *Defense Daily* 4.
- Beardsley, T., "The Way to Go in Space" *Scientific American* 280:2 (February 1999) 80.
- Bodde, D.L., "Space Policy in a Vacuum" (22 May 1998) 280:5367 *Science* 1171.
- Burgess, J., "Satellites' Gaze Provides New Look at War" *Washington Post* (19 February 1991) 13.
- Covault, C., "Military Space Dominates Air Strikes" AW&ST 150 (29 March 1999) 31.
- _____, "USAF Urges Greater Use of SPOT Based on Gulf War Experience" AW&ST 137 (13 July 1992) 61.
- _____, "Desert Storm Reinforces Military Space Directions" AW&ST 134 (8 April 1991) 42.
- Estes, H.M., "Space: Fourth Medium of Military Operations" *Defense Issues* 11:98 (1996) 1.
- Fulghum, D.A., "USAF Covets Space Laser" AW&ST 143 (20 November 1995) 34.
- Furniss, T., "Storm Support From Space" *Flight International* 139 (3 April 1991) 48.
- Gertz, B., "The Secret Mission of NRO" *Air Force Magazine* (June 1993) 60.
- Gillert, D.J., "Estes Unveils Long-Range Space Plan" *Air Force News Service* 15 April 1998.
- Gilmartin, P.A., "France's SPOT Satellite Images Helped U.S. Air Force Rehearse Gulf War Missions" AW&ST 134 (29 April 1991) 55.
- Grier, P., "Arena of Space" *Air Force Magazine* 79 (September 1996) 44.
- Horner, C.A., "Space Systems Pivotal to Modern Warfare" *Defense* 94:4 (1994) 20.
- _____, "Space Seen as Challenge, Military's Final Frontier" *Defense Issues* 8:34 (22 April 1993) 1.
- Kaminski, P.G., "Space Forces Essential to Modern Military" *Defense Issues* 10:41 (1995) 1.
- Kolcum, E.H., "Military Leaders Say GPS Success in Gulf Assures Tactical Role for Satellites" AW&ST 134 (13 May 1991) 89.
- Kutyna, D.J., "SPACECOM: We Lead Today, But What about Tomorrow?" *Defense* 91 (July/August 1991) 20.
- Leifer, S.D., "Reaching for the Stars" *Scientific American* 280:2 (February 1999) 94.

- Lopez, G.A., "The Gulf War: Not So Clean" *Bulletin of the Atomic Scientists* 47 (September 1991) 30.
- Mann, P., "Historic Turn Eyed in Missile Defense" *AW&ST* 151:1 (5 July 1999) 30.
- Marcus, D.J., "News Events from 'Desert Storm' Seen Via Intelsat Links" *Space News* 2 (21 January 1991) 17.
- Matthews, W., "The Ultimate High Ground: In a Shrinking Air Force, Space Troops are Poised to Shine" *The Air Force Times* (18 May 1998) 12.
- McClinton, C.R., "Air-Breathing Engines" *Scientific American* 280:2 (February 1999) 84.
- Nordwall, B.D., "Imagination Only Limit to Military, Commercial Applications for GPS" *AW&ST* 135 (14 October 1991) 60.
- Saunders, R. & Kiernan, V., "Satellites Relay War Front Imagery to Pentagon Officials" *Space News* 2 (21 January 1991) 17.
- Scott, W.B., "'Beam' Weapons Edging Into Arsenal" *AW&ST* 151:1 (5 July 1999) 53.
- _____, "Space Ops Threatened by Launch Failures" *AW&ST* 150:20 (17 May 1999) 25.
- _____, "Space Chief Warns of Threats to U.S. Commercial Satellites" *AW&ST* 150:15 (12 April 1999) 51.
- _____, "U.S. Adopts 'Tactical' Space Control Policy" *AW&ST* 150:13 (29 March 1999) 35.
- _____, "'Milspace' Maturing into Warfighting Role" *AW&ST* 147:9 (1 September 1997) 46.
- _____, "Wargames Underscore Value of Space Assets for Military Ops" *AW&ST* 146:18 (28 April 1997) 60.
- _____, "Pentagon Considers Space As New Area of Responsibility" *AW&ST* 146:12 (24 March 1997) 54.
- _____, "USSC Prepares for Future Combat Missions in Space" *AW&ST* 145:6 (5 August 1996) 51.
- _____, "'Architect' to Reshape Defense Space Policy" *AW&ST* 144 (20 February 1995) 50.