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INTEGRATION OF MILITARY AND CIVILIAN SPACE ASSETS: LEGAL AND NATIONAL SECURITY IMPLICATIONS

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July 2003

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements of the LL.M degree

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Abstract

The increasing intermingling of civilian and military space activities could lead to serious, and perhaps unintended, consequences. While international space law is very permissive with regard to military uses of space, there are considerable legal and security implications resulting from military and civilian dependence on the same space services. From a military perspective, intentional reliance on civilian systems must address, *inter alia*, national security concerns, contractual obligations, licensing restrictions, liability, and long-term political relationships, while respecting the interests of the commercial sector. Policy decisions leading to an increase in civilian-military space interdependence must also consider potential impacts of this symbiosis on trade, international relations, and the conduct of armed hostilities.

The thesis addresses these and certain related issues in four chapters. The first chapter explores the depth of the interdependence of military and civilian users on the same space systems. The second chapter considers the implications of dual use space technologies, such as proliferation concerns. The third chapter discusses various legal mechanisms States employ to address security issues involving space activities. The final chapter outlines legal restrictions on the use of space assets by armed forces.

Abstract

L'interconnexion croissante des activités spatiales à caractère civil et militaire, pourrait avoir de sérieuses conséquences, sans doute inattendues. Alors que le Droit international spatial est très permissif en ce qui concerne les activités à caractère militaire poursuivies dans l'espace, il y a d'immenses implications tant sur le plan légal qu'en matière de sécurité en ce qui concerne la dépendance du militaire et du civil sur ces mêmes systèmes spatiaux. Du point de vue militaire, la confiance qui est accordée aux systèmes civils doit répondre, entre autres, aux problèmes et enjeux: de sécurité nationale, de respect des obligations contractuelles, de restrictions liées à l'émission de licence, de responsabilité et enfin de poursuite de relations politiques sur le long terme, tout en prenant en considération les intérêts du secteur privé. Toute decision politique, ayant pour but d'accroître l'interdépendance des activités civil et militaire dans l'espace doit également prendre en considération les impacts potentiels de cette union sur le commerce, les relations internationales et la conduite de conflits armés.

La présente thèse s'attache à répondre, en quatre chapitres, à ces questions, ainsi qu'à certaines autres qui pourraient y être rattachées. Le premier chapitre traite de l'étroite interdépendance du militaire et du civil sur les mêmes systèmes spatiaux. Le second chapitre décrit les implications de la double utilisation des technologies spatiales, et envisage les problèmes liés à la prolifération des armes. Le troisième chapitre commente l'utilisation par les Etats de divers mécanismes légaux ayant pour but de résoudre les problèmes liés à la sécurité nationale lorsque ceux ci impliquent des activités spatiales. Le dernier chapitre, enfin, résume les restrictions légales qui sont attachées à l'utilisation des biens situés dans l'espace par les forces armées.

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I owe a debt of gratitude to my thesis supervisor, Professor Ivan A. Vlasic. Like so many US Air Force officers before me, I was fortunate to have had the opportunity to study under a most distinguished scholar and gentleman, and I thank him for his insights, encouragement, and fairness.

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Table of Contents

Disclaimer ii

Abstract iii

Abstract iv

Acknowledgements v

I. Introduction 1

II. The Military and Civilian "Marriage" in Space (A Survey) 3

A. Space Actors 3
1. The Military 3
2. The Military-Civilian "Marriage" 6
a. Civilian Governmental Programs 6
b. Private Entities and the Commercial Sector 9
3. The "Space-faring" States 14

B. Relevant Technologies and Partnerships 16
1. Launching Facilities and Services 16
2. Communications 17
3. Remote Sensing/Earth Observation by Satellite 18

III. National Security Implications of "Dual Use" Technologies 24

A. A Special Concern: Implications of Dual Use Launch Technology 26

B. Governments' Need for Unimpeded Access to Space 27

IV. Legal Regulations Designed to Address National Security Concerns 29

A. Protecting Access to Space 29
1. National Security Exceptions in Domestic Licensing Procedures 29
2. Government Efforts to Keep a Healthy Space Industry 32
3. World Trade Organization (WTO) Influence on the Industry 39

B. Protecting Access to Sensitive Space Technology 45
1. Export Controls 45
2. Tensions between Competition and National Security 50

C. Protecting Space Assets: The Potential Use of Force in Space 53

D. Protecting Access to Space Services 57
1. Launching Facilities and Services 58
2. Communications 60

3. Remote Sensing/Earth Observation by Satellite 63
4. Navigational Aids 70

V. Legal Restrictions on Military Use of Space Assets 72

A. Contractual and Policy Restrictions 72

B. Liability 77

C. Rules of Engagement as the Implementation of Law and Policy 81
1. Self-defense 83
2. The Use of Force for Mission Accomplishment 87
a. The Law of Armed Conflict 87
b. "Peaceful Purposes" 89
c. Arms Control Limitations 92
d. ROE Relating to Outer Space 94

D. Legal Implications of Military Reliance on Civilian Systems 94
1. Neutrality Implications of "Dual Use" Technologies 95
2. Civilians Controlling Space Systems: Unlawful Combatants? 97

VI. Conclusion 100

Bibliography 102

I. Introduction

> *Statesmen and soldiers must consider the legal and moral ramifications of using civilian systems for military purposes. Such military use may turn them, as well as their supporting infrastructure, into a bona fide target for future opponents.*
>
> **- Brigadier General Charles J. Dunlap, Jr., US Air Force[1]**

While maintaining its own space assets and capabilities, in the past few years the US military has increasingly relied on commercial and civilian space assets, owned and operated by foreign, domestic, and even international entities. As part of a larger general trend toward military "outsourcing," such non-military organizations may provide cheap, technologically advanced space commodities in a number of areas, *e.g.* launch, communications, remote sensing, and weather. Even in situations in which the military relies on its own space assets (such as navigation, launch, and surveillance), partnerships with and investment in non-military (and even non-domestic) entities are common and openly encouraged. This work will briefly look at the nature of these partnerships, and then examine the national security and legal implications of such "dual use" of space technology, including the effect on technology transfer and the law of war.

This thesis will first explore the depths of the military, civilian, and commercial "marriage" in space, looking at the "actors" and the "partnerships" in various settings. The use of space by each of these entities has evolved, and an examination of their current roles in space activities will be discussed, by survey of the various space services provided by these sectors: communications, remote sensing, launch, and navigation.

The next section of the thesis will examine national security and legal implications of military investment, use, and reliance on space systems that are not exclusive military

[1] Dunlap, Charles J., Jr., "Technology: Recomplicating Moral Life for the Nation's Defenders" (Autumn 1999) Parameters 24 at 30.

assets. States have made efforts to protect their interests in space by protecting access to *space*, space *technology*, and space *services* in a number of ways. From a military perspective, national security in large part depends on predictable, guaranteed access to space, which in turn depends on a strong domestic space industry. Therefore, the tension between competition and technology transfer to foreign companies and States (proliferation) is important to consider. The Cox Report and Boeing (Sea Launch) affairs, with their allegations of improper technology transfer to China and Russia respectively, will serve as case studies for this section, both to illustrate these tensions and to pinpoint sources of additional legal restrictions. This section will also explore the suggestion that the interdependence of military and commercial systems in space has caused national security and competition to become mutually reinforcing, rather than competing, goals.

Additionally, as armed forces increasingly rely on space services (often the same services used by civilians), States will develop means to guarantee continued access to those services. This thesis will examine contractual guarantees and licensing restrictions, using military leasing of communications satellites and governmental "shutter control" clauses for remote earth sensing satellites as examples of such efforts. States must be careful how they seek to protect their national security interests in space, since the methods they choose may be subject to legal challenge. In this context, the impact of the World Trade Organization (WTO) on the space industry will be discussed. Next, the thesis will survey limits on "dual use" technologies imposed by policy and politics, specifically examining the Presidential restriction on the use of Selective Availability

(SA) in the Global Positioning System (GPS), the division of the radio frequency spectrum, and the issue of space debris.

The implications of relying on non-exclusively military space assets in time of peace and war will also be examined, by surveying legal rules and restrictions on such use. A brief survey of relevant international law, including the UN Charter, treaties, customary law, and the Law of Armed Conflict (LOAC), follows. In more detail, the right of self-defense (including so-called "anticipatory self-defense") will be discussed. While most analyses stop at this level, it is important to look at the operational context of military commanders applying these concepts through Rules of Engagement (ROE). The implications of space law and policy on ROE will be canvassed.

Finally, widespread military use of civilian systems in time of war also brings with it other, perhaps unintended, consequences and issues. This section will consider the true status of "neutral" nations knowingly providing space services in support of armed conflict, and whether civilian control of militarily-used space systems renders the civilians unlawful combatants under the law of war.

II. The Military and Civilian "Marriage" in Space (A Survey)

A. Space Actors

1. The Military

The original "space powers" were the Soviet Union and the United States (US). As early as 1945 both nations had considered the potential use of satellites for military purposes, but it wasn't until 1954 that the US Air Force was first authorized to develop a

reconnaissance satellite.[2] However, the Soviet Union preempted the early, rather lethargic, US satellite-development effort when, in October 1957, it successfully launched Sputnik I. The Soviet Union's placement of the first satellite into orbit around the earth sparked a sense of urgency in the US to prove *its* mastery of the space dominion, arguably initially for prestige purposes.[3] However, satellites soon became important to the US from a practical perspective as well, when in 1960 the era of US aerial reconnaissance flights over the Soviet Union ended, and the US was forced to depend on reconnaissance satellites to obtain strategic information about its adversaries.[4] Thus began the US' consistent reliance on space systems that has only deepened in the ensuing four decades.

During the Cold War, the Soviet Union and the US governments developed and operated many military satellites and dominated the world's space activities. According to one account, in the 1970s an estimated 60% of Soviet payloads served direct military missions; by the early 1980s, 75% were of the same nature.[5] Space was also of growing importance to the US military, as evidenced by the 1982 creation of a separate Space

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[2] Paul B. Stares, "Space and US National Security" in William Durch, ed., *National Interests and the Military Use of Space* (Cambridge, Mass.: Ballinger, 1984) at 35 [Stares, "US National Security"]; Paul B. Stares, *The Militarization of Space: US Policy 1945-1984* (Ithaca, NY, Cornell University Press: 1985) at 13 [Stares, *Militarization*].

[3] Although the US launched its first satellite in 1958, this sense of urgency is still evident in President John F. Kennedy's address to the US Congress in 1961:

> *This is not merely a race. Space is open to us now; and our eagerness to share its meaning is not governed by the efforts of others. We go into space because whatever mankind must undertake, free men must fully share.*

Statement of the President, Special Message to Congress on Urgent National Needs (25 May 1961).

[4] Stares, "US National Security," *ibid.* at 37. The shoot-down of Gary Powers' U-2 over the Soviet Union on 1 May 1960 ended the era of US aerial reconnaissance over the Soviet Union. The National Reconnaissance Office (NRO) was created in September 1961 to consolidate US reconnaissance efforts.

[5] Stephen M. Meyer, "Space and Soviet Military Planning" in William Durch, ed., *National Interests and the Military Use of Space* (Cambridge, Mass.: Ballinger, 1984) at 61.

Command within the US Air Force.[6] By 1985, reportedly the US and the Soviet Union together had put over 2,000 military payloads into orbit.[7]

In the earliest years of the "Space Age", satellites were mainly useful in maintaining peace and stability through reconnaissance, intelligence-gathering, early warning, and as the National Technical Means (NTM) of verification for monitoring arms control compliance. Thus, for example, the 1972 Anti-Ballistic Missile (ABM) Treaty provided for the use of NTMs (with satellite observation as a critical component) to verify compliance with strategic arms limitations. The ABM Treaty recognized the importance of the role played by NTMs and therefore prohibited interference with them.[8] However, recent years have seen increasing military reliance on satellites as "force multipliers" or "force enablers" improving the performance, lethality, and effectiveness of ground, air, and naval forces and weapons, both during peace and war.[9]

> *Space systems and capabilities enhance the precision, lethality, survivability, and agility of all operations – air, land, sea, and special operations. [. . .] Space assets contribute significantly to overall aerospace superiority and support the full spectrum of military actions in theaters of operations.*[10]

In fact, space systems have become so important to the US that the government has declared:

> *[p]urposeful interference with U.S. space systems will be viewed as an infringement on our sovereign rights. The U.S. may take all*

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[6] Colin S. Gray, *American Military Space Policy: Information Systems, Weapons Systems, and Arms Control* (Cambridge, Mass., Abt Books: 1982) at ix.
[7] Stares, *Militarization*, *supra* note 2 at 13.
[8] *Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems*, 23 U.S.T. 3435 (entered into force 3 October 1972, but no longer in effect as of 13 June 2002 due to US withdrawal), Art. XII [ABM Treaty]; US White House, Press Release, "Statement by the Press Secretary Announcement of Withdrawal from the ABM Treaty" (13 December 2001), online: White House <http://www.whitehouse.gov/news/releases/2001/12/20011213-2.html>.
[9] Stares, "US National Security," *supra* note 2 at 4 and 72.
[10] US Air Force Doctrine Document 2-2, *Space Operations* (23 August 1998).

> *appropriate self-defense measures, including, if directed by the National Command Authorities (NCA), the use of force, to respond to such an infringement on U.S. rights.*[11]

Several US government publications have similarly called space a "vital national interest," a traditional governmental term of art for objectives of such importance that armed force would be used to protect them.[12]

2. The Military-Civilian "Marriage"

a. Civilian Governmental Programs

From the outset, US civilian governmental space programs were largely kept separate from military efforts -- to avoid any public questioning of the stated US commitment to the peaceful use of space and to avoid international, political opposition to military programs.[13] However, even at the earliest stages of development, it was obvious that military-civilian governmental cooperation in space programs was necessary to capitalize on technical expertise and to avoid wasteful duplication of effort.[14] In fact, in the 1960s the civilian governmental National Aeronautics and Space Administration (NASA) was very dependent on US Air Force personnel and facilities.[15] The covert National Reconnaissance Office (NRO), the DOD agency primarily responsible for space

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[11] US DOD Directive (DODD) 3100.10, *Space Policy* (9 July 1999) at 6 [*Space Policy*]. The NCA are "the President and the Secretary of Defense or their duly deputized alternates or successors." US DOD Joint Pub 3-0, *Department of Defense Dictionary of Military and Associated Terms* (23 March 1994) at 253.

[12] John M. Logsdon, *Reflections on Space as a Vital National Interest*, online: George Washington University's Space Policy Institute <http://www.gwu.edu/~spi/> (expressing skepticism whether space has actually been recognized and funded as such an interest), citing The White House, *A National Security Strategy for a New Century* (December 1999) and US DOD, *Quadrennial Defense Review Report* (30 September 2001) at 45 [Logsdon, *Reflections*].

[13] Stares, "US National Security," *supra* note 2 at 38 and 41; *The NASA Act of 1958*, Pub. L. No. 85-568, 72 Stat. 426, 42 U.S.C. §2451 *et seq* (1988) (creating a civilian governmental space agency and maintaining DOD control over military programs).

[14] *Ibid* at 41.

[15] Stares, *Militarization*, *supra* note 2 at 62, quoting Secretary of Defense Robert McNamara's 1962 policy directive giving the Air Force responsibility for "the research, development, test, and engineering of

intelligence programs whose very existence was kept secret until 1992, interacted with the military and with NASA, transferring selected technologies and sharing launch facilities and command and control ground stations.[16]

This "separate but intertwined" nature of military and civilian governmental space programs is still evident today, and cooperation between the two sectors has been increasing in recent years. One need only look at the sheer number of governmental agencies (the Department of Defense (DOD), Department of Transportation (DOT), Department of Commerce (DOC), and National Aeronautics and Space Administration (NASA), to name but a few) involved in the US space program to see the immense overlap.[17] Civilian governmental space programs have been largely carried out by NASA since the inception of the US space program.[18] Responsible for civilian research and development, NASA has focused on manned spaceflight (through the Space Shuttle program and the International Space Station), reusable launch technology, space science and technology. An indication of ever-closer cooperation between NASA and the US Air Force (the DOD's executive agent for space) can be seen in recent discussions to assess the feasibility of developing a single launch vehicle to meet civilian, commercial, *and* military launch requirements.[19] Furthermore, the current NASA Administrator, Sean

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satellites, boosters, space probes, and associated systems necessary to support specific NASA projects and programs."

[16] Thomas S. Moorman, Jr., "The Explosion of Commercial Space and the Implications for National Security" (Paper presented to the National Convention of the American Institute of Aeronautics and Astronautics, Reno, Nevada, 13 January 1998)[unpublished], online: George Washington University Space Policy Institute <http://www.gwu/ ~spi>.

[17] US DOD, *Space Technology Guide* (FY 2000-2001), online: Office of the Secretary of Defense (OSD) <http://www.c3i.osd.mil/org/c3is/spacesys/> at 1-5, listing 42 such agencies and organizations.

[18] Bob Preston and John Baker, "Space Challenges" (Study of the RAND Corporation, 14 May 2002), online: RAND <http://www.rand.org/publications/MR/MR1314> at 144 [Preston and Baker].

[19] Marcia S. Smith, "Space Launch Vehicles: Government Activities, Commercial Competition, and Satelllite Exports" (Issue Brief for Congress by the Congressional Research Service (CRS), 3 February 2003, Doc. No. IB93062) [Smith, *Space Launch Vehicles*].

O'Keefe, is a former Secretary of the Navy.[20] The NRO has also been restructured to improve its support for direct military uses -- its Director is now the Under Secretary of the Air Force for Space and its acquisition program is aligned under an Air Force office.[21] Growing nationwide civilian reliance on space systems has also expanded the involvement of other civilian governmental agencies in the past few years. For example, the Department of Commerce (DOC) now has management and regulatory responsibility over meteorological earth observation satellite systems in a joint project with DOD and NASA, over commercial remote sensing, and has a large role in trade and export policy.[22] The DOT, through the Federal Aviation Administration (FAA), has a growing role in regulating commercial launch activities, many of which are currently performed at governmental launch facilities.

In addition to the more obvious increasing organizational and programmatic alignment, military and civilian governmental space programs are "married" in other ways. Technology is part of the reason for the blurred line between the two – there is an inherent overlap, given that applications useful for one side may be directly or at least indirectly useful to the other.[23] Civilian governmental programs use military space systems like the Global Positioning System (GPS); the military uses civilian assets, such as the Space Shuttle. Additionally, the sheer expense of placing space systems in orbit means that civilian and military missions may share a launch pad, a launch vehicle, and perhaps even the same space platform, requiring a degree of technological and practical

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[20] Marcia S. Smith, "US Space Programs: Civilian, Military, and Commercial" (Issue Brief for Congress by the Congressional Research Service (CRS), 22 April 2003, doc. no. IB92011) at 7 [Smith, *US Space Programs*].
[21] Preston and Baker, *supra* note 18 at 158; see also online: NRO <http://www.nro.gov>.
[22] *Ibid* at 146.
[23] Gray, *supra* note 6 at 78.

compatibility.[24] Finally, the physical limitation of available orbits and radio frequencies for military and civilian systems demands a detailed technological awareness of many attributes of one system while designing and operating the other, to avoid harmful interference.

b. Private Entities and the Commercial Sector

The past two decades have seen a tremendous increase in commercial space activity. The commercialization of space has caused further blurring of lines between military and non-military systems. Again, technology is the main reason for the blurred line between the two – with a few exceptions,[25] applications useful for one side (*e.g.*, meteorology, navigation, remote sensing, and communications) are generally useful to the other. In addition, military, civilian governmental, and commercial space systems all rely on the same space industry (which means the identical pool of experts, and therefore the same pool of knowledge) to develop, service, and often even maintain space systems. Furthermore, economic benefits result if all sectors procure space technology from the same industry.

Since 1982 the US government has actively pursued the goals of "expand[ing] United States private sector involvement and involvement in civil space and space related activities."[26] For example, the US Congress passed several laws specifically aimed at

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[24] For example, the US space shuttle has been used for both military and civilian missions.
[25] Space technologies for which there is likely no commercial demand include: missile warning, signals intelligence, weapon systems with integrated surveillance systems, assured communications, and space weapons. Moorman, *supra* note 16.
[26] US White House, "Fact Sheet on National Space Policy" (4 July 1982).

commercializing launch services (in 1984, 1988, 1990, and 1998),[27] and Congress, in an attempt to encourage the private sector's involvement in earth imaging by satellite, tried to privatize the government's Landsat remote sensing satellite program in 1984, although the effort ultimately failed.[28] Notably, the US government still does not dominate the commercial satellite market. According to one report, in 2001 the federal government provided only about 10 percent of commercial satellite industry revenue.[29]

Recently a US Congressionally-mandated government commission assessing space issues recognized that the US is "increasingly dependent on the commercial space sector to provide essential services for national security operations," and that it will continue to rely on the commercial sector for the same reason.[30] This reliance is not limited to a single type of space service; instead, examples of such services provided by commercial entities include satellite earth imagery, communications, and launch services. However, US policy goes further than mere recognition of the interdependence of the commercial and the government sectors *and openly encourages it*. Current DOD guidance, for instance, describes a "Preference for Commercial Acquisition," prohibiting development of systems for national security "unless suitable and adaptable commercial alternatives are not available . . . Commercial systems and technologies shall be leveraged and

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[27] Smith, *US Space Programs, supra* note 20 at 4 (referring to the *1984 Commercial Space Launch Act*; *1988 Commercial Space Launch Act Amendments*; *1990 Launch Services Purchase Act*; and *1998 Commercial Space Act*).

[28] *Ibid.* (citing to the *1984 Land Remote Sensing Commercialization Act,* Pub. L. No. 98-365 (codified as amended at 15 U.S.C. §4200) and the *Land Remote Sensing Policy Act of 1992,* Pub. L. No. 102-555 (codified as amended at 15 U.S.C. §5601)).

[29] US General Accounting Office (GAO), Report to the Ranking Minority Member, Permanent Subcommittee on Investigations, Committee on Governmental Affairs, U.S. Senate, *Critical Infrastructure Protection: Commercial Satellite Security Should Be More Fully Addressed* (August 2002), GAO-02-781 at 29, online: Defense Daily <http://www.defensedaily.com/reports/101102fully.pdf> [GAO Report on Satellite Security].

[30] US, Commission to Assess US National Security Space Management and Organization, *Report of the Commission to Assess US National Security Space Management and Organization, pursuant to P.L. 106-*

exploited whenever possible."[31] DOD policy also encourages military-industrial partnerships, outsourcing and privatization of DOD space-related functions and tasks. The government even extends a promise of "[s]table and predictable US private sector access" to DOD space-related hardware, facilities, and data.[32] The goal of the US government to promote commercial-governmental interdependence is furthered by requiring that government space systems be based on widely accepted commercial standards to ensure future interoperability of space services.[33]

Despite the quick maturation of the US commercial space sector, it has not achieved independence from military and civilian governmental programs.[34] In particular the commercial sector has been criticized for failing to capitalize on potential markets before ground-based systems filled a niche.[35] The trend of deregulation that contributed to the initial growth of commercial space services also appears to have slowed, stopped, and even reversed for some space applications, stunting further rapid growth.[36] As a result, many commercial companies rely heavily on military and civilian governmental customers. In addition, the space industry depends on governmental funding for technology at the research and development level.[37]

65,(11 January 2001), online: <http://www.space.gov/doc/fullreport.pdf> [Space Commission]. This Commission was headed by now-Secretary of Defense Donald Rumsfeld.

[31] *Space Policy, supra* note 11.

[32] *Ibid.*

[33] *Ibid.*

[34] Preston and Baker, *supra* note 18 at 148.

[35] *Ibid.* The most obvious example is mobile telecommunications.

[36] *Ibid*; Joanne I. Gabrynowicz, *Expanding Global Remote Sensing Services: Three Fundamental Considerations* (Paper presented to the International Institute of Space Law at the Third United Nations Conference on the Peaceful Uses of Outer Space (UNISPACE III), Vienna, Austria, 21 July 1999). Remote sensing and export controls are two examples where regulation has increased in recent years.

[37] Preston and Baker, *supra* note 18.

c. International Entities

Up to now, this survey has mainly focused on the US experience. However, the 1960s saw the entrance of other States and international entities into space activities. This is an important development for two reasons: first, foreign governments and entities also rely on civilian, commercial, and international space activities (although not to the extent that the US and Russia do), hence an analysis of the implications of the interdependent US space program is equally relevant for such a space-active State; second, it will be instructive to examine how different countries address the seemingly contradictory demands of national security and competition in the global market for space technology.

Foreign governments began to enter the satellite market in the 1960s. In 1964, eleven States formed a type of international, intergovernmental cooperative (the International Telecommunications Satellite Consortium - later changed to Organization - or Intelsat) to provide universal telecommunications services on a non-discriminatory basis. [38] Other similar intergovernmental entities followed over the next few years.[39]

Twenty years into the so-called Space Age finally saw the beginning of commercial sector involvement in space activities, adding both competition and opportunities for cooperation. *International* commercial sector joint ventures, such as Sea Launch (formed by companies of the US, Ukraine, Russia, and Norway), Starsem (formed by companies

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[38] Christian Roisse, "The Roles of International Organizations in Privatization and Commercial Use of Outer Space" (Discussion paper presented to the Third ECSL Colloquium, Perugia, Italy, 6-7 May 1999). Intelsat was "the first international organization created to serve the needs of public telecommunications by satellite." Francis Lyall, *Law & Space Telecommunications* (Worcester: Dartmouth Publishing, 1989) at 74 [Lyall].

[39] Among others, Intersputnik (the 1972 creation of the former Soviet Union and the communist bloc), International Maritime Satellite Organization (Inmarsat, a smaller system created in 1976 to meet the needs of maritime traffic), and the European Telecommunication Satellites (Eutelsat, a regional organization to

of Russia and France), and International Launch Services (ILS) (formed by companies of the US and Russia), entered the space market in the 1990s.[40] Thus, the 2003 space market is a multinational industry made of governmental and commercial entities.

Recognizing the opportunities made possible by such a global market, US policy is to pursue international cooperation and partnerships "to the maximum extent feasible."[41] The US DOD in its *Space Policy* has declared that

> *[m]ultinational alliances can increase U.S. space capabilities and reduce costs, as well as give the U.S. access to foreign investment, technology and expertise . . . Civil multinational alliances provide opportunities for the United States to promote international cooperation and build support among other countries, especially emerging space-faring nations and developing countries, for U.S. positions on international policy or regulatory concerns.*[42]

Therefore, it is clear that the interdependence of military and non-military space systems is a *global* and *intentional* phenomenon, based on advances in technology, proliferation of technology, market forces, and political linkage of space technology with other issues. To illustrate, here are some examples of recent US military reliance on non-US, commercial sector space services:

> • *In 1991, the U.S. military procured commercial remote sensing imagery from a non-U.S. company during Desert Storm [The French SPOT Image satellite system]. Commercial satellite communications services were critical to U.S. Army missions.*
>
> • *In 1995, the U.S. Navy bought more than two million minutes of service on an intergovernmental satellite system constellation [Inmarsat], and many Navy ships communicate through the system today.*

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serve Europe). Lyall, *ibid.* (providing detailed descriptions of these and other international satellite communication organizations).

[40] Smith, *Space Launch Vehicles, supra* note 19.

[41] *Ibid.* See also US White House, "Fact Sheet on National Space Policy" (4 July 1982), *supra* note 26.

[42] *Space Policy, supra* note 11.

• *The U.S. Government has leveraged commercially-developed direct broadcast satellite technology for its Global Broadcast Service.*[43]

Possibly the strongest example of the growing international military dependence on civilian space systems is the use of the same Arabsat satellite by both Iraqi and Coalition forces for military communications during the first Gulf War.[44]

3. The "Space-faring" States

The usual yardstick for whether a State is "space-faring" or a "space power" is whether it can *build and launch* satellites. [45] Thus, the "space-faring" States currently are the US, Russia, France, the Ukraine, members of the European Space Agency (ESA), China, Japan, India, and Israel.

The former Soviet Union and the US dominated the space launch market through the 1970s, but the 1980s and 1990s saw a steady increase in foreign competition for cheaper, reliable launches. In 1982 the European Space Agency (ESA) conducted its first operational launch; by 1999 it had grown to the point that it captured 80% of the launches to Geostationary Orbit (GSO) that year.[46] (The ESA conducts its launches through Arianespace, a private company partially owned by the French Space Agency, *Centre National d'Etudes Spatiales* (CNES).)[47] In 1988 a Chinese company for the first time signed a contract with Asia Satellite Telecommunications Co., Ltd (AsiaSat) to launch a

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[43] Space Commission, *supra* note 30.
[44] Phillip J. Baines, "A Variant of a Mandate for an Ad Hoc Committee on Outer Space within the Conference of Disarmament: A Convention for the Non-Weaponization of Outer Space" in J. Marshall Beier and Steven Mataija, eds., *Arms Control and the Rule of Law: A Framework for Peace and Security in Outer Space (Proceedings of the Fifteenth Annual Ottawa NACD Verification Symposium)* (York University, Toronto:1998) at 71.
[45] Smith, *US Space Programs*, *supra* note 20.
[46] Smith, *Space Launch Vehicles*, *supra* note 19.
[47] I.H.Ph. Diederiks-Verschoor, I.H.Ph., *An Introduction to Space Law*, 2nd ed., (The Hague: Kluwer Law, 1999) at 113.

US-built satellite.[48] In 1994, Japan launched its first all-Japanese rocket capable of placing satellites in GSO; it has contracts with two US satellite manufacturers for commercial launches and has also developed imagery intelligence satellites for its national defense.[49] In 1999 India performed its first commercial launch, launching German and South Korean satellites.[50] Both China and India have, in addition to their proven launch abilities, achieved great success in earth-sensing and space communications technology.[51] Launch vehicles and technology continue to be an important source of hard currency for the depressed Russian economy. Israel and Canada are emerging as leaders in the international commercial remote sensing market.[52] Thus, it is clear that the US and Russia no longer dominate the space industry.

> *While world satellite manufacturing revenues increased by 9% in 2000, the U.S. satellite manufacturing revenues actually declined by 11%. Similarly, world launch industry revenues grew by 29% in 2000 while the U.S. launch industry revenues grew by only 17%.*[53]

In light of this competitive, international market for space services, the key issue is how States can compete for business and at the same time protect their national security interests, especially given the high probability that their militaries, like the US armed forces, are dependent on the commercial sector and on commercially provided services.

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[48] Patrick A. Salin, "An Overview of US Commercial Space Legislation and Policies – Present and Future" (June 2002) 27:3 Ann. Air & Sp. L. 209 [Salin].
[49] Preston and Baker, *supra* note 18 at 160.
[50] Smith, *Space Launch Vehicles*, *supra* note 19.
[51] Preston and Baker, *supra* note 18 at 160.
[52] *Ibid.*
[53] Satellite Industry Association (SIA)/Futron, *Satellite Industry Indicators Survey: 2000/2001 Survey Results*, online: Futron website <http:/www.futron.com>.

B. Relevant Technologies and Partnerships

To further illustrate the depths of the interdependence between the civilian, commercial, and military sectors in space, the thesis will now review some major "partnerships" and cooperative efforts between these sectors in several relevant technologies. Subsequent sections will discuss the various ways governments protect their national security interests despite this interdependence.

1. Launching Facilities and Services

Commercial space launch, more than other space applications, depends heavily on government sponsorship, through both military and civilian investment.[54] Even in the US, federal launch facilities (operated by either the Air Force or NASA) support both governmental and commercial launches although, notably, the number of commercial launches from these facilities is almost half of the total launches.[55] While there are some commercially owned launch facilities internationally,[56] it is difficult for commercial entities to overcome the economic benefits of government-sponsored launches.[57] For example, since 1997 the FAA has licensed four commercial spaceports in the US, all of which have successfully launched small satellites; however, three of these spaceports are co-located with federal launch facilities and cooperate extensively with federal agencies.[58]

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[54] Preston and Baker, *supra* note 18 at 151.
[55] Space Commission, *supra* note 30.
[56] Sea Launch, for example, launches from a commercially-owned, converted ocean oil-drilling platform towed into the Pacific Ocean. See online: Sea Launch <http://www.sea-launch.com/>.
[57] Preston and Baker, *supra* note 18 at 151.
[58] Virginia Space Flight Center, Kodiak Launch Complex (Alaska), Spaceport Florida, and California Spaceport. US, DOC, *Trends in Space Commerce*, 2000 at 2-14. The Kodiak site is the only one of these not co-located with a federal facility. US FAA, *2003 2nd Quarter Report*, online: FAA <http://ast.faa.gov> at 43.

The launch *service providers,* even at these government facilities, are often commercial companies such as Boeing and Lockheed Martin. These same commercial entities support commercial launches, civilian governmental launches, and military launches. Boeing and Lockheed Martin, for example, provide launch vehicles and services for commercial launches, provide services for shuttle launches through their joint venture as United Space Alliance (USA) and have received billions of dollars from DOD to develop the next generation of Evolved Expendable Launch Vehicles (EELVs).[59] In short, the military, NASA, and the commercial sector have all expended great efforts and investment, often in direct partnership, in an attempt to reach the common goal of reducing the expense of delivering satellites to orbit.

2. Communications

Satellite communications systems have long been the backbone of the commercial space industry. Although the military has its own dedicated satellite communication systems,[60] these systems cannot alone handle the military's increasing demand for communications services – a demand which has risen sharply as the military moves real-time data and video from headquarters to military commanders deployed to foreign areas of operation. Furthermore, the military needs compact, mobile communications systems, which is the very technology gaining in popularity in civilian and commercial sectors. Accordingly, the military has leased and plans to continue leasing commercial satellite communications capacity.[61] For example, the DOD uses leased Intelsat circuits to supplement its capabilities; in fact, some DOD satellite command and control facilities

[59] Smith, *Space Launch Vehicles*, *supra* note 19 at 8.
[60] For example, among others the military maintains and uses the Milstar and Defense Satellite Communications System (DSCS) systems.

routinely use Intelsat to relay data from its satellites.[62] During the first Gulf War, Intelsat provided about 25% of the military communications to and from the theater of operations. Through a program called Gapfiller, the Navy leased Inmarsat transponders to meet communications requirements in Somalia and Kuwait in the 1990s. As recently as March 2003, prior to the recent war in Iraq, military officials were hurriedly leasing commercial satellite communications capacity to meet wartime military requirements.[63] Military reliance on civilian communications systems is expected to continue, despite a planned, next-generation, joint US military and intelligence communication system.[64]

> *The Department of Defense and the Intelligence Community are not likely to own and operate enough on-orbit [communications] assets to meet their requirements. According to RAND Corporation, "in the near term, there are not enough military systems to satisfy projected communications demand and commercial systems will have to be used." The Department of Defense uses commercial services on a daily basis.*[65]

3. Remote Sensing/Earth Observation by Satellite

Remote sensing is the collection of data which is processed into images of the surface features of the earth. Once confined to national security objectives benefiting the military and intelligence sectors, remote sensing is now being developed and used for civilian and commercial ends such as environmental monitoring, pollution tracking, natural disaster prediction and response, agriculture planning, and mapping.[66] Though the imagery available from commercial systems is reportedly not yet as precise as that available from

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[61] Space Commission, *supra* note 30.
[62] *Ibid.*
[63] Loring Wirbel, *Space Net Would Shift Military to Packet Communications* (9 April 2003) Electrical Engineering Times, online: <http://www.commsdesign.com>.
[64] *Ibid.* The Transformational Communications Architecture (TCA) is the planned system.
[65] Space Commission, *supra* note 30.
[66] Michael R. Hoversten, *U.S. National Security and Government Regulation Of Commercial Remote Sensing From Outer Space* (2001) 50 A.F. L. Rev. 253.

military systems, commercial high-resolution systems (which in fact are often modified versions of military systems and are often developed by the same companies) can now produce imagery of a quality formerly only available from military systems.[67] In fact, since 1994 the policy of the US has been to encourage the development of commercial satellite imaging systems with a resolution of less than one meter or less and to promote the sales of such images internationally.[68] The National Oceanic and Atmospheric Administration (NOAA), the US agency responsible for licensing commercial remote sensing systems, has already licensed a commercial system with a resolution of 0.6 meters,[69] a resolution that allows differentiation between objects as small as a bicycle and of such quality that "[i]nformed estimates suggest . . . would satisfy approximately half of the National Imaging and Mapping Agency's (NIMA's) requirements for information on the location of objects on the earth."[70] Systems fielded by France, Russia, India, and Israel already offer imagery ranging from 10-meter to 1-meter resolution.[71]

The easy access to such high-resolution data, while a national security concern, also offers great benefit to the military and intelligence sectors. Indeed, the US government

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[67] Smith, *US Space Programs, supra* note 27 at 4; Wulf von Kries, *Dual Use of Satellite Remote Sensing,* online: International Network of Engineers and Scientists Against Proliferation <http://www.inesap.org/bulletin17/bul17art21.htm> [von Kries].

[68] Peter L. Hays, *Transparency, Stability, and Deception: Military Implications of Commercial High Resolution Imaging Satellites in Theory and Practice* (Paper presented at the International Studies Association Annual Convention, Chicago, 21-24 February 2001) [unpublished]. This policy initially was the result of the combination of the Land Remote Sensing Act of 1992 (allowing licensing of private remote sensing systems) and the March 1994 Presidential Decision Directive (PDD)-23 *U.S. Policy on Foreign Access to Remote Sensing Space Capabilities* (9 March 1994) (allowing international sale of resulting data). PDD-23 has been superceded by the new White House remote sensing policy of 25 April 2003, *infra* note 74.

[69] DigitalGlobe's Quickbird. Space Commission, *supra* note 30

[70] NIMA has the statutory duty to provide imagery intelligence and geospatial information to the DOD; Kristin Lewotsky, "Remote Sensing Grows Up: A Maturing Application Base and Gradual Commercialization Mark the Future of the Remote-Sensing Market" *Optical Engineering Magazine* (April 2001), online: Society for Optical Engineering <http://www.oemagazine.com/fromTheMagazine/archives.html>; see also US Chamber of Commerce, online: <http://www.uschamber.org/space/policy/remotesensing.htm>.

has been one of the international commercial remote sensing industry's main customers.[72] In recent years it has become a habit of the US military to use open commercial sources like the French *Systeme Probatoire d'Observation de la Terre* (SPOT) or the US Landsat system for military purposes such as reconnaissance, missile launch warning, targeting, strategic and tactical planning, arms treaty compliance, and damage assessment. The US Air Force was the largest customer of commercial imagery in the world in 2001.[73] In April 2003 the White House announced a new remote sensing policy *requiring* Government agencies to utilize US commercial remote sensing space capabilities to the maximum extent practicable to meet imagery and geospatial needs, with the goal of protecting national security and foreign policy interests by enhancing the US civilian remote sensing industry.[74] Military and intelligence agencies worldwide are now considering entering into firm agreements with commercial remote sensing data suppliers. For example, NIMA (which has the statutory duty to purchase all commercial imagery products for the US DOD) recently announced its plan to award more than $1 billion in contracts over a five-year period to American companies able to provide 1-meter resolution imagery.[75] In January 2003 NIMA awarded multi-year contracts to buy high-resolution satellite imagery from US-based companies Space Imaging and DigitalGlobe.[76]

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[71] Smith, *US Space Programs, supra* note 20 at 4.
[72] Hoversten, *supra* note 66.
[73] Linda L. Haller and Melvin S. Sakazaki, "Commercial Space and United States National Security" (Paper prepared for the Commission to Assess US National Security Space Management and Organization (2000))[unpublished] at 44 [Haller and Sakazaki].
[74] US White House, Press Release, "Fact Sheet: Commercial Remote Sensing Policy" (25 April 2003), online: White House <http://www.whitehouse.gov/news/releases/2003/05/20030513-8.html>.

[75] Preston and Baker, *supra* note 18 at 151.
[76] US DOD, NIMA Press Release, "NIMA Partners with Remote Sensing Industry" (17 January 2003), online: NIMA <http://www.nima.mil/cda/article/0,2311,3104__113967,00.html>. These agreements are

Already, the pointed marketing policies of commercial remote sensing entities, which are specifically directed at national security customers, indicate the growing interdependence of the military, intelligence, and commercial sectors in remote sensing activities.[77] The convergence of traditionally separate military and civilian remote sensing is particularly visible in non-Western States (*e.g.*, India) who establish a single, multipurpose remote sensing system rather than the traditional Western parallel military and commercial systems.[78] Even the Japanese Advanced Land Observation Satellite (ALOS), a civilian governmental mapping and environmental research satellite with about 2.5-meter resolution, has been referred to as "nothing more than a Japan Defense Agency mission in disguise."[79]

Notably, military and civilian *meteorological* satellites have merged into single systems at the national and international level,[80] which may portend similar mergers of other types of space-based earth observation platforms in the future. After many unsuccessful attempts to merge operation of civilian and military meteorological satellite systems, the US National Polar-Orbiting Operational Environmental Satellite System

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together referred to as "Clearview". Space Imaging is guaranteed a minimum of $120 million over the next three years, and DigitalGlobe $72 million. Scottie Barnes, "NIMA lets long-awaited Remote Sensing Contract" *Geospatial Solutions* (22 January 2003), online: Geospatial Solutions <http://www.geospatial-online.com/geospatialsolutions/article/articleDetail.jsp?id=44033>; Frank Morring, Jr., "Industry Could Gain $1 billion from NIMA" *Aviation Week & Space Technology* (27 January 2003) at 31.

[77] von Kries, *supra* note 67, stating "Thus, the Orbimage company, under the rubric of "National Security", advertises the following applications for its one meter imagery: "resource deployment, mission planning, targeting, battle damage assessment, intelligence gathering, and trend analysis." Another US consortium, Space Imaging, in one trade publication was described as "virtually an NRO (National Reconnaissance Office) outlet store."

[78] *Ibid.*

[79] Kyle T. Umezu, "EarlyBird Tweaks the Law" *Japan Space Net* (1997), online: Space Daily <http://www.spacedaily.com> (quoted in Haller and Sakazaki, *supra* note 73).

[80] Haller and Sakazaki, *supra* note 73. In the US, the civil Polar-Orbiting Operational Environmental Satellite (POES) program and the military Defense Meteorological Satellite Program (DMSP) have been merged. In France, discussions have discussed the potential merger of the civilian Spot and military Helios remote sensing systems.

(NPOESS) was created in 1998 to provide meteorological information to both civilian and military customers.[81] NPOESS is an integrated national meteorological system, resulting from a Presidentially-directed 1994 joint NASA, DOD, and NOAA enterprise, which merged the former civilian governmental Polar-Orbiting Operational Environmental Satellite (POES) program and the former military Defense Meteorological Satellite Program (DMSP). In the merger, the military ceded operational control over its system to NOAA. At the same time, the US system is being merged with European meteorology systems, creating the *international* Joint Polar System (JPS).[82]

During the 20 years of operating separate meteorological systems, the Air Force and NOAA used similar satellites, similar launch vehicles, and increasingly "shared products derived from the data, provided complementary environmental data to the nation, and worked together on research and development for their separate programs."[83] This national and international merger is instructive because it reflects a practical approach to effective use of resources after a period of increased convergence of military and civilian systems, a pattern other space systems are currently following, as outlined in this thesis.

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[81] "Air Force Turns over Weather Satellite Control to NOAA" *Air Force News Service* (2 June 1998), online: Federation of American Scientists (FAS) <http://www.fas.org/spp/military/program/met/n19980602_980767.html>. It is estimated that the DOD and DOC will save a $1.3 billion by combining the two programs into one.

[82] Joanne I. Gabrynowicz, *Expanding Global Remote Sensing Services: Three Fundamental Considerations* (Paper presented to the International Institute of Space Law at the Third United Nations Conference on the Peaceful Uses of Outer Space (UNISPACE III), Vienna, Austria, 21 July 21 1999) at 112 [Gabrynowicz, *Considerations*].

[83] *Ibid.* See also Preston and Baker, *supra* note 18 at 146.

4. Navigational Aids

The Global Positioning System (GPS) is the current preeminent international space-based navigation system.[84] It provides another example of the convergence between military, commercial, and civilian space sectors. However, unlike the other examples in which the military relies on civilian systems, GPS is a US military-operated system relied on by civilians. As one former FAA administrator noted:

> *I guarantee you that the U.S. DOD did not foresee that its GPS would be hijacked by the civilian economy. But it happened, and the world's politicians and diplomats need to solve this problem now.*[85]

The Global Positioning System (GPS) offers precise, all-weather, 24-hour-a-day, three-dimensional positioning and timing information worldwide. The US military (as well as armed forces of other nations) depends greatly on GPS; for example, in the first six days of Operation Iraqi Freedom in 2003, more than 80 percent of all munitions used by Coalition forces were precision-guided, with the majority of these being guided by GPS.[86] Initially developed in the 1970s solely as a military navigation system, GPS now also has literally millions of civilian users who rely on it for aviation, marine, and road navigation, emergency response, mining, surveying, and oil exploration. The commercial

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[84] Paul B. Larsen, "Issues Relating to Civilian and Military Uses of GNSS" (2001) Space Policy 111. The Global Navigation Satellite System (GLONASS) is the Russian counterpart to the US GPS, but it does not have a full satellite constellation and is not adequately funded. The European Union (EU) and the European Space Agency (ESA) are developing a European satellite navigation system, Galileo, which is scheduled to be operational in 2008.

[85] Langhorne Bond, "The GNSS Safety and Sovereignty Convention of 2000 AD" (Summer 2000) 65 J. Air L. & Com. 445 at 446.

[86] "Delta Rocket Takes GPS Satellite into Orbit" *Air Force Print News* (1 April 2003).

market for GPS receivers and applications reached $6.2 billion in 2000 and, according to one estimate, is anticipated to reach $16.1 billion by 2005.[87]

The GPS system is *operated* by DOD but since 1996 has been *managed* by the Interagency GPS Executive Board (IGEB), chaired jointly by DOD and DOT with membership including the Departments of State, Commerce, Interior, Agriculture, and Justice, as well as NASA and the Joint Chiefs of Staff.[88] The creation of the IGEB reflects national recognition that GPS is a system serving globally both military and non-military users. Further evidence that the US government recognizes the importance of GPS to civilian users worldwide is the 1 May 2000 termination of Selective Availability (SA), *i.e.*, the degradation of the accuracy of the signal provided to civilian users of the system.[89] The original intent of SA was to deny the maximum accuracy of the GPS signal to hostile military forces; until 1 May 2000, SA created inaccuracies of up to 100 meters in the signal provided to all civilian users worldwide.

III. National Security Implications of "Dual Use" Technologies

"Dual use" technology is traditionally defined as technology that is commercial or civilian in nature, but that can be used either directly or indirectly to produce sophisticated weaponry (*e.g.*, computer hardware and software, encryption software, and ceramics).[90] However, the current interdependence of military and non-military space

[87] Haller and Sakazaki, *supra* note 73; Justin Ray, "Delta Doesn't Disappoint in Successful GPS Launch" *Spaceflight Now* (31 March 2003).
[88] For more information, see online: IGEB <http://www.igeb.gov>.
[89] US White House, Press Release, "Statement by the President Regarding the United States Decision to Stop Degrading Global Positioning System Accuracy" (1 May 2000), online: US Coast Guard Navigation Center <http://www.navcen.uscg.gov/gps/selective_availability.htm>.
[90] R. Aylan Broadbent, "U. S. Export Controls on Dual-Use Goods and Technologies: Is the High Tech Industry Suffering?" (Summer 1999) 8 Currents Int'l Trade L.J. 49, citing Vago Muradian, "Better Export Controls Needed to Check *Dual-Use* Technologies" (1998) 198 Def. Daily 8 at 8 [Broadbent].

services has implications beyond this traditional definition, since the identical space *services*, not just the underlying technology, are used by both civilians and military simultaneously. This gives rise to very delicate policy considerations. On the one hand, cooperation with foreign nations promotes political and economic ties with those nations, enhances mutual and collective defense capabilities through technological interoperability, and gives a State access to foreign technology (lowering costs, increasing business for domestic companies, and thereby strengthening overall domestic economy). On the other hand, since so much space technology is potentially or actually "dually used," the providing of such technology and services must not be done in such a way as to jeopardize national security. Therefore, the requirements of arms control, nonproliferation, export control, and foreign policy must be considered before sharing such technologies and services internationally.[91]

In fact, the very concept that any technology may be called "dual use" based on its inherent characteristics has been criticized – experts state that the dual use nature of any technology depends on its *actual use*, acknowledging that this judgment is made based on prevailing policy.[92] Under this reasoning, proliferation control regulations should focus on the *use* rather than on the nature of the technology itself. Furthermore, not only must States be concerned about the risk of giving militarily useful technology to the *direct* recipient, but they should also be concerned about the proliferation of that same technology *from* the recipient nation to others. Another important consideration for a space-dependent State is the fact that the more it relies on space services, especially for

[91] *Space Policy, supra* note 11.
[92] von Kries, *supra* note 67 (stating, "The dual-use notion, therefore, is not relatable to the nature of a specific technology but to circumstantial employment and prevailing policy assessment, especially under

military and national security purposes, the more it needs guaranteed access to those services and to space itself.

A. A Special Concern: Implications of Dual Use Launch Technology

Because of the "dual use" nature of space technology, States must be concerned about who receives this technology. In this regard, space launch technologies are a special concern for two reasons. First, new launch technology may be used directly for military purposes -- the identical launch pad and launch vehicle may be used by the recipient nation to launch military, as well as civilian, payloads. Even in the US, military launch facilities support both government and commercial launches.[93]

The greatest concern, however, is that space launch vehicles essentially are ballistic missiles, capable of delivering nuclear, chemical, and biological weapons of mass destruction rather than "peaceful" payloads. In fact, many of today's space launchers are slightly modified intercontinental ballistic missiles (ICBMs).[94] The Chinese *Long March* space launch vehicles, for example, are manufactured by the same company that makes its nuclear ICBMs and "have the same staging mechanism, air frames, engines and propellants and employ similar payload separation and guidance system hardware."[95] As such, the issue of which States have access to space launch technology is of great concern. A State possessing launch technology must address its proliferation concerns

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proliferation policy aspects. It follows that the concept of dual-use technologies is spurious, and thus of no systematic utility.").

[93] Space Commission, *supra* note 30.

[94] Victor Zaborsky, *Evolving US Satellite Export Policy: Implications for Missile Nonproliferation and US National Interests* (Jan-Mar 2000) Comparative Strategy 57 [Zaborsky, *Export Policy*].

[95] Daniel R. Kempton and Susan Balc, "High Seas Satellite Launches: Paragon of Post Cold War Cooperation or Unregulated Danger?" (Paper presented to the International Studies Association (ISA) Convention of International Studies, Hong Kong, 26-28 July 2001) [unpublished], online: ISA'S 2001 Convention Paper Archive <http://www.isanet.org/paperarchive.html>, quoting Guy Gubliotta, Walter

and, at the same time, ensure its domestic space launch industry is strong enough to guarantee its State access to space.

B. Governments' Need for Unimpeded Access to Space

The US believes "[t]he ability to access and utilize space is a vital national interest because many of the activities conducted in the medium are critical to US national security and economic well-being."[96] Many experts hold that the guaranteed ability to access space is only achieved by maintaining a healthy domestic industrial base, including commercial launch services, and government policies that support international competitiveness.[97]

> *As the line between military and civilian technology becomes increasingly blurred, what remains clear is that a second class commercial satellite industry means a second class military satellite industry as well--the same companies make both products, and they depend on exports for their health and for revenues that allow them to develop the next generation of products.*[98]

As mentioned previously, the US has adopted specific legislation designed to encourage commercial space sector growth, especially in launch services, after learning a difficult lesson about the importance of having strong commercial launch alternatives. In 1972 development of the space shuttle began with President Nixon's declaration, "The general reliability and versatility which the Shuttle system offers seems likely to establish it quickly as the workhorse of our whole space effort, taking the place of all present

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Pincus and John Mintz, "Classified Report at Heart of Accusation of Technology Loss to China" *Washington Post* (31 May 1998).

[96] *Space Policy, supra* note 11 at 6.

[97] Space Commission, *supra* note 30; see also US Chamber of Commerce, "Promote a Strong Domestic Space Launch Capability", online: <http://www.uschamber.com/space/policy/launchcapability.htm>.

[98] Broadbent, *supra* note 90 (quoting congressional testimony of William A. Reinsch).

launch vehicles except the very smallest and very largest."[99] Soon after the first shuttle launch in 1981, production lines for the Delta and Atlas launchers began to shut down, since the US government planned to rely exclusively on the shuttle, the Titan IV, and the Scout launchers.[100] Thus, through the mid-1980s the US relied heavily on the space shuttle for both military and civilian launches.[101] During that time, the infant US commercial launch industry argued that it simply could not compete against the artificially low costs of government-subsidized shuttle launches.

The importance of maintaining a strong commercial space launch alternative to the shuttle was vividly demonstrated in 1986, when the explosion of the space shuttle *Challenger* grounded the shuttle fleet, resulting in a shortage of alternative US launch vehicles.[102] This launch vehicle shortage directly contributed to the growth of Arianespace and other foreign launch providers, since satellite manufacturers and operators looked overseas for launch services. Prompted by a desire to avoid a repeat dependence on foreign providers, US policy now recognizes the importance of domestic spacelift to military operations, noting that it gives the military the "ability to project power by delivering satellites, payloads, and material into or through space . . . us[ing] a combination of military, DOD civilian, and civilian contractor personnel to process, integrate, assemble, check out, and launch space vehicles."[103] Accordingly, States must balance proliferation concerns, international relations, and domestic space industry issues through legal regulations and policy.

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[99] US White House, Press Release, "Statement by President Nixon Announcing Final Approval of the Space Shuttle Program" (5 January 1972), online: NASA <http://history.nasa.gov/stsnixon.htm>.
[100] *Ibid.*
[101] Smith, *Space Launch Vehicles*, *supra* note 19 at 2.
[102] *Ibid.* To this day, commercial payloads may not be flown on the shuttle unless they are "shuttle-unique" or foreign policy requires shuttle launch of a specific payload.
[103] AF Doctrine Document (AFDD) 2-2, *Space Operations* (23 August 1998), supra note 10 at 20.

IV. Legal Regulations Designed to Address National Security Concerns

Because of concerns about the dual use nature of space technology, States have made efforts to protect their access to *space*, protect access to space *technology*, and protect access to space *services*. Protecting access to space consists of two strategies: limiting access to space by others and ensuring a State's own access to space, mainly by maintaining viable domestic space industries.[104]

A. Protecting Access to Space

1. National Security Exceptions in Domestic Licensing Procedures

The first level of "defense" States employ to protect themselves from the misuse of dual use space technology is to limit access to space, through licensing restrictions in domestic legislation. States control the use of space for many reasons, but only a few shall be briefly mentioned here. First, States bear international responsibility and liability for national activities, including activities by private entities, in space.[105] Therefore, domestic legislation and licensing restrictions are one way States can accept this

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[104] A detailed discussion of the technical means to deny access to space assets by others is beyond the scope of this thesis, although potential space weapons are briefly discussed below, section IV (C).

[105] These concepts are summarized by one scholar in the following way:

> *Two closely connected terms have been used: "liability" and "responsibility." Neither of these terms has been defined in space law but the term "liability" has been used to set the launching state's liability for damage caused by space objects, whereas the word "responsibility" has been used to mandate international responsibility by the appropriate state party for national activities in outer space. [. . .] [I]n connection with "liabilities" we are dealing with legal consequences (mostly in terms of damages) arising from a particular behavior. In contrast, it seems that when we speak of responsibilities, we are dealing primarily with obligations imposed on people and institutions who are supposed to carry out certain activities or are accountable in given situations though not necessarily in the form of compensation for damages.*

Stephen Gorove, "Liability in Space Law: An Overview" (1983) 8 Ann. Air & Sp. L. 373 at 373 (discussing the two terms under domestic law and international law through two treaties: (1) *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, T.I.A.S. 6347, 610 U.N.T.S. 205, Articles VI and VII [*Outer Space Treaty*] and (2) *Convention on International Liability for Damage Caused by Space Objects*, 29 March 1972, 961 UNTS 187 [Liability Convention]).

obligation *and* apportion the risks of such activities. Second, States have an interest in assuring the efficient use of space without harmful interference. Licensing restrictions can help meet this goal, as can management of radio frequencies and the geostationary orbit (GSO) through domestic implementation of the international regime under the International Telecommunications Union (ITU).[106] Third, States also have an interest in ensuring that the use of space does not threaten its national security. Licenses are a powerful way to address this concern.

In addition to the standard licenses required to conduct business in a State, special licenses are required to engage in certain space activities. For example, licenses are required to launch a space launch vehicle and to operate a launch site in the US.[107] Licenses are also required to operate a remote sensing space system.[108] Therefore, a US remote sensing operator, for example, may need three or even four different licenses:

(1) a remote sensing operating license,

(2) a radio frequency license for satellite uplink and downlink,

(3) a launch license, and

(4) an export license (if required in a specific case).[109]

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[106] The ITU, the oldest "specialized agency" within the United Nations system, regulates international use of the radio frequency spectrum. Headquartered in Geneva, Switzerland, the ITU is the organization through which governments and the private sector coordinate global telecommunications networks and services, including satellite communications. The ITU serves three major functions: (1) regulating the radio frequency spectrum, (2) establishing rate and equipment standards for telecommunications, and (3) coordinating use of the highly desired geostationary orbit. Francis Lyall, *Law & Space Telecommunications* (Worcester: Dartmouth Publishing, 1989) at 311 and 387. For more information on the ITU, see online: ITU <http://itu.org>; J. Wilson, "The International Telecommunication Union and the Geostationary Satellite Orbit: An Overview" (1998) 23 Ann. Air & Sp. L. 249; *Constitution and Convention of the International Telecommunication Union*, 22 December 1992 (Geneva: ITU, 1992). In the US, the international regime is implemented through the Federal Communications Commission (FCC). See 47 C.F.R. 25.

[107] 49 U.S.C. §701; 14 C.F.R. 400-450.

[108] *Ibid.*; *Land Remote Sensing Policy Act of 1992*, *supra* note 28.

[109] Michael R. Hoversten, *U.S. National Security and Government Regulation of Commercial Remote Sensing from Outer Space* (2001) 50 A.F. L. Rev. 253 at 267.

While it might not appear at first blush that such domestic laws could have a great effect in the international space market, in practice these US laws have a broad (even "extraterritorial") reach, since they apply to actions taking place on or off US soil if the persons or entities involved have sufficient ties to the US (*e.g.,* a US citizen with a "controlling interest" in a launch company, or a mere 5% US equity interest in a foreign remote sensing firm).[110] Thus, as a practical matter, these licensing restrictions may have wide international implications.

That national security is a major factor in the decision to grant each of the above types of license is obvious when one considers the purposefully broad applicability of the laws. In addition, most States openly include national security or national interest as a factor in deciding whether or not to grant a license to engage in space activities. For example:

(1) Australia
(Australia's *Space Activities Act of 1998* – can refuse a license "for reasons relevant to Australia's national security, foreign policy, or international obligations." The Act applies to domestic launches and overseas launches by domestic entities.)[111]

(2) South Africa
(*Space Affairs Act* – takes into account the minimum safety standards, the national interest of South Africa, as well as international obligations and responsibilities.)[112]

(3) United States
(*Commercial Space Act 1998* – can prevent a launch if it "would jeopardize the public health and safety, [. . .] or any national security interest or foreign policy interest" of the US)[113]

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[110] *Ibid.* 14 C.F.R. 401.5(n) creates a rebuttable presumption that a US controlling interest exists if 51% of the equity is held by US citizens or a US entity.
[111] *Space Activities Act of 1998, Acts of Parliament of the Commonwealth of Australia* No. 23, s. 18(e)(assented to 21 December 1998).
[112] *Space Affairs Act, Statutes of the Republic of South Africa* No. 84 of 1993, § 11(2) (assented to 23 June 1993)(commenced 6 September 1993).
[113] *Commercial Space Launch Act of 1984*, Pub L. No. 98-575 §6(b)(2), 98 Stat. 3055 (1994)(as amended in 1998).

(*Land Remote Sensing Policy Act* – licensee shall "operate the system in such manner as to preserve the national security of the United States and to observe the international obligations of the United States.")[114]

Finally, even when States grant licenses to engage in space activities, the license itself may impose additional conditions and restrictions. For example, remote sensing operators frequently have additional restrictions imposed on them (see below, section IV(D)(3)).

2. Government Efforts to Keep a Healthy Space Industry

As already mentioned briefly, many experts believe that the goals of national security are only achieved by maintaining a healthy domestic industrial base in space technology and government policies that support international competitiveness.[115] However, the appropriate role of the government in assuring a healthy space industry has been a recurring subject of great debate.[116] Even within the "space industry" there are often opposing views about how to maintain this strong technological base. For example, satellite manufacturers and space launch providers do not always share the same views -- satellite manufacturers are interested in getting their products launched as cheaply as possible, which may mean exporting satellites and components for foreign launches, while domestic satellite launch providers themselves want to offer these services.[117]

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[114] 15 U.S.C. § 5622(b)(1).

[115] US, Commission to Assess US National Security Space Management and Organization, *Report of the Commission to Assess US National Security Space Management and Organization, pursuant to P.L. 106-65*,(11 January 2001), online: <http://www.space.gov/doc/fullreport.pdf> [Space Commission]; see also US Chamber of Commerce, "Promote a Strong Domestic Space Launch Capability", online: US Chamber of Commerce <http://www.uschamber.com/space/policy/launchcapability.htm>.

[116] Smith, *US Space Programs, supra* note 20, summary.

[117] See Victor Zaborsky, "Economics vs. Nonproliferation: US Launch Quota Policy Toward Russia, Ukraine, and China" (Fall-Winter 2000) The Nonproliferation Review 152 at 154 [Zaborsky, "Economics"].

The US reaction to the threat to its role in the space launch industry in the late 1980s is particularly noteworthy in this regard. Due to the relatively late entry of US *commercial* entities to the launch industry, in large part because of early US focus on the space shuttle, the US commercial space launch sector was still in its infancy in the mid-1980s.[118] At that time the US made the "pioneering decision to apply free market principles to the space launch industry" so that US satellite manufacturers could launch their satellites on foreign rockets, allowing them flexibility in launch scheduling and ending their dependence on the space shuttle.[119] As a result, over the next decade foreign entities began to take an increased percentage of the total worldwide launches. In the late 1980s and the early 1990s the greatest threat perceived by US launch service providers was competition from the non-market economies of China, Russia, and the Ukraine.[120] The US reacted by negotiating bilateral agreements with these three States to set the "rules of the road" in order to ensure fair competition.[121] A specific fear of the US was that these States, which had relatively advanced missile and space industries, could provide high-quality launch services at extremely low prices due to their non-market economies and inexpensive labor costs.[122] The US also feared that the excess ballistic missiles in the former Soviet republics and China would further lower production costs in

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[118] Smith, *Space Launch Vehicles*, *supra* note 19.
[119] Zaborsky, *Economics*, *supra* note 117 at 153.
[120] *Ibid.*
[121] *1989 Bilateral Agreement on International Trade in Commercial Space Launch Services* [Chinese Launch Agreement], reproduced at 28 I.L.M. 596 (1989); *Guidelines for US Implementation of the Agreement between the US and Russian Federation Government regarding International Trade in Commercial Launch Services*, USTR, 59 Fed. Reg. 47 (10 Mar 1994) [Russian Launch Agreement]; *Agreement Between the Government of the United States of America and the Government of Ukraine Regarding International Trade in Commercial Space Launch Services*, online: US Trade Representative (USTR) <http://www.ustr.gov/releases/1995/12/95-91.html> [Ukrainian Launch Agreement].
[122] *Ibid.*

these economies, since it was easier and cheaper to convert existing ballistic missiles to launchers than to start creating them from scratch.

All along the US claimed that these bilaterals were intended to be "transitional measures allowing for the non-disruptive entry" of economies in transition into the commercial launch market.[123] Even with this language indicating the temporal nature of the bilaterals, they were harshly criticized as "protectionist, parochial, and paranoid" and were openly opposed by US satellite manufacturers.[124] America was even described by one commentator as "using national security concerns to cloak protectionist tendencies."[125]

In general the bilaterals set conditions over how the three States (China, Russia, and the Ukraine) could participate in the satellite launch market, by imposing these general terms on the non-market economy State:

> (1) **pricing** (had to be "on par" with, or "comparable to" Western-provided launches);[126] and
>
> (2) **quotas** (limited the number of commercial launches the State could perform per year).[127]

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[123] US Trade Representative (USTR), Press Release, "United States Reaches Agreement with Ukraine on a Commercial Space Launch Agreement" (14 December 1995), online: US Trade Representative (USTR) <http://www.ustr.gov/releases/1995/12/95-91.html>.

[124] Frank Sietzen, Jr., "Europeans Deride US Launch Industry as 'Xenophobic'" *Space.com News* (18 July 2000), online: Space.com <http://www.space.com/businesstechnology/business/angry_eurolaunchers_000718.html> [Sietzen] (quoting Peter van Fenema); see also Zaborsky, *supra* note 117 at 153.

[125] Sietzen, *ibid.*

[126] The most recent Chinese agreement assumed pricing was consistent if the price bid was within 15% of Western bids. The Russian agreement called for consultations if the bid price was 7.5% below the market bid. The Ukraine agreement called for consultations if the bid price was 15% below market standards. Chinese Launch Agreement, Russian Launch Agreement, Ukrainian Launch Agreement, *supra* note 121.

[127] Peter van Fenema, *The International Trade in Launch Services: The Effect of US Laws, Policies and Practices on its Development* (Leiden, Netherlands: 1999) [van Fenema].

The US was able to insist on such regulatory terms because most satellites and components had (and have) components manufactured in the US that could not be exported for launch without the US granting an export license.[128] In fact, in 1988 the decision whether or not to allow export gave the US such leverage over the first Chinese commercial launch that, in addition to the pricing and quota restrictions, the US was also able to insist that China accept both liability in case of damage and restrictive technology transfer safeguards to prevent the transfer of militarily useful technology during the launch operations (*e.g.*, by requiring storage of the satellite in locked facilities and prohibiting the transfer of equipment and technical data).[129]

The six-year US-Chinese Launch Trade Agreement was signed in January 1989, along with the above-described Technology Safeguards and Liability Agreements. Only six months after the agreements were signed, however, the Tiananmen Square incident occurred and the granting of satellite export control licenses became linked to human rights reform. Ever since this incident, a specific Presidential waiver has been required to export satellites for launch in China.[130] In the years since 1989, exports of satellites to China have been on-again-off-again, as the granting of these exports licenses has also been linked to alleged Chinese ballistic missile transfers to Iran, Syria, and Pakistan.[131] The complex US-Chinese relationship over commercial launches perfectly underscores how space technology is intertwined with and linked to broader national security and political issues. It appears that the more the military relies on space assets and systems, the more likely these external linkages are to continue.

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[128] *Ibid.* at 185.
[129] *Ibid.* at 205 and 208; Chinese Launch Agreement, *supra* note 121.
[130] Smith, *Space Launch Vehicles*, *supra* note 19 at 10 (referring to Pub. L. No. 101-162 and Pub. L. No. 101-246 §902).

In addition to linkages with foreign policy and human rights, the very terms of the Chinese agreement itself became the source of pricing controversies based on the unclear wording of the agreement. As one expert noted,

> *The launch trade agreement, instead of creating a stable and predictable regulatory environment for the US and Chinese industries concerned, became itself subject to the political uncertainties caused by the multifaceted US-Chinese relationship, which involved human rights, trade and non-proliferation issues [. . .]*[132]

A new agreement, clarifying several disputed terms, was signed in 1995. Ultimately, the Chinese launch agreement (with its quotas and pricing restrictions) ended in December 2001.[133]

Similar agreements were signed between the US and Russia and between the US and the Ukraine after the breakup of the former Soviet Union.[134] As with the Chinese agreement, both bilaterals exhibited similar "links" to US national security and political concerns. In fact, part of the US motivation for encouraging the entry of Russia and Ukraine into the commercial launch market was to promote conversion of the former Soviet military industry to peaceful uses in the interests of US national security. Specifically, the 1993 Russian agreement was part of a "package deal" in which Russia and the US merged space stations and Russia agreed to adhere to the Missile Technology Control Regime (MTCR), requiring Russia to renege on a $400M contract with India for cryogenic rocket engine technology.[135] Similarly, the 1996 Ukrainian launch agreement was linked to two other separate but related agreements that were signed in 1998, one on the peaceful use of nuclear energy (giving Ukrainian companies compensation for broken

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[131] *Ibid.*
[132] van Fenema, *supra* note 127 at 215.
[133] Smith, *Space Launch Vehicles*, *supra* note 19.

business deals with Iran for nuclear turbines) and the other on non-proliferation of missile technology.[136]

Although there were disagreements over the next few years between Russia and the US about some terms in the launch agreement,[137] the disagreements were not as controversial as those with the Chinese. This is likely due, at least in large part, to the fact that Russian, Ukraine, and US companies were partners in joint ventures. Thus, US satellite manufacturers and launch companies were benefiting from Russian and Ukrainian launches.[138] The Ukrainian agreement explicitly encouraged such joint ventures (recognizing Sea Launch specifically) by increasing quota limits for launches performed by US-Ukrainian joint ventures.[139] Both the Russian and Ukrainian launch agreements expired in 2000, along with the quotas and pricing restrictions. Notably, the Ukrainian agreement was terminated early in recognition of the Ukraine's "steadfast commitment to international non-proliferation norms."[140]

The late 1990s anticipated a very large market for Low Earth Orbit (LEO) mobile satellite telecommunications services.[141] However, with the bankruptcy of several of the companies and the uncertainty of the future profitability of others, the demand for satellite launches since 1999 has been lower than anticipated, with an associated oversupply of launch vehicles, making the current global commercial launch market

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[134] van Fenema, *supra* note 127; Russian Launch Agreement and Ukrainian Launch Agreement, *supra* note 121.
[135] *Ibid.* For a detailed discussion of the MTCR, see below, section IV(B)(1).
[136] *Ibid.*
[137] For example, in 1994 the US accused Russia of cheating to get around the quotas through "on-orbit leasing" -- by launching a domestic Russian payload (that wouldn't count as a foreign launch for quota purposes) but immediately leasing the satellite to a foreign nation. Also, in 1997 the US accused Russia of selling ballistic missile technology to Iran. *Ibid.*
[138] *Ibid.*
[139] Ukraine Launch Agreement, *supra* note 121.
[140] Smith, *Space Launch Vehicles*, *supra* note 20 at 16.
[141] *Ibid.*

intensely competitive.[142] Accordingly, States are once again keenly aware of foreign competition for launch services and, as a result, have adopted protective measures for their ailing domestic space industries. These measures have been very controversial, as States have accused each other of implementing unfair governmental subsidies in the space industry.[143]

Potentially, there are a number of ways in which States could subsidize their space industries, directly or indirectly. For example, governments could pay the commercial sector for government projects and launches, give tax incentives or tax breaks to space companies, issue loan guarantees to help up-front financing, provide government liability insurance, allow the commercial sector to use military or government launch sites, and require domestic payloads to be launched from domestic launch vehicles. In the bilateral agreements with the non-market economies discussed above, "government inducements" (described as "no bribes, no threats, no trade-offs, no special 'deals'")[144] were prohibited. However, it is clear that governments do help promote their space industries in several of the ways outlined above. For example, the US has complained about the European Union's $8.3 billion and $2.1 billion investments into the development and performance upgrades, respectively, of the *Ariane* 5 rocket.[145] Interestingly though, the US government (through the DOD) has invested $3 billion in the development of the US' next generation Evolved Expendable Launch Vehicle (EELV) by two US commercial

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[142] US Chamber of Commerce, "Promote a Strong Domestic Space Launch Capability," online: US Chamber of Commerce <http://www.uschamber.com/space/policy/launchcapability.htm>.
[143] Smith, *Space Launch Vehicles*, *supra* note 20.
[144] van Fenema, *supra* note 126 at 201.
[145] US Chamber of Commerce, *supra* note 142.

companies.[146] The European Union has also complained about the US policy requiring that US government payloads be launched on US-manufactured launch vehicles.[147]

In the current, depressed space launch industry, continuing government financial support will no doubt be advocated and criticized. In fact, the US Congress has recently debated further industry subsidies, but no action has yet been taken. The European Space Agency is now considering minimum guaranteed purchases of *Ariane* launches by European Union member states to keep Arianespace from going bankrupt.[148] As armed forces rely increasingly on commercial space systems and insist on guaranteed access to space, debates about the proper role of government in space trade will no doubt continue, since domestic subsidies may be seen as necessary for national security. On the other hand, the military's reliance on *foreign* space systems and *international* service providers may encourage a more open, *global* free trade market.

3. World Trade Organization (WTO) Influence on the Industry

Although the WTO regime has the potential to affect the space industry in many ways, this thesis will only briefly address national security implications of the WTO as regards space services. The stated goal of the WTO is to encourage smooth, predictable, fair, and free trade. This is accomplished through international negotiations aimed at lowering trade barriers.[149] From the perspective of the space industry, the impact of the WTO may be seen either in a positive light (as international promotion of a healthy global space industry through free trade and open competition) or in a negative light

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[146] *Ibid.*
[147] Smith, *Space Launch Vehicles*, *supra* note 20 at 9.
[148] *Ibid.* at 10.
[149] See online: WTO <http://www.wto.org>; *Agreement Establishing the World Trade Organization*, 15 April 1994, 33-5 I.L.M. 1125.

(placing limitations on a government's ability to protect an industry vital to its national security).

The WTO "umbrella" covers trade both in goods and services. Since commercial telecommunications (including those provided by satellite), remote sensing, space-based navigational aids, and space launch services are "services", they fall under the General Agreement on Trade in Services (GATS).[150] Trade in "goods", on the other hand, is addressed by the General Agreement on Tariffs and Trade (GATT). Therefore, government subsidies for the development of launch vehicles and satellites are covered by the GATT.[151] Accordingly, the role of the WTO, which up to now has been limited in the space market, is expected to grow in the coming years as these commercial sectors expand.[152] In fact, a recent US Government commission stated that the US must develop a coherent policy to consider WTO negotiations about market access for commercial satellite systems.[153]

The GATS provides for three important liberalization principles potentially relevant to space services: most-favored nation (MFN), market access, and national treatment. The MFN principle is a "general obligation," which means the principle applies unconditionally to all services -- as soon as a service is offered in a national market, the MFN principle applies to it. For general obligations such as MFN, a State must

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[150] *General Agreement on Trade in Services*, 20 1991, GATT Doc. MTN TNC/W/FA [GATS]; Domenico Giorgi, "WTO and Space Activities" (Paper presented to the Third ECSL Colloquium, Perugia, Italy, May 1999). On 5 February 1998, the WTO's Fourth Protocol to the GATS for Basic Telecommunications Services took effect, requiring signatories to open their telecommunications markets to foreign competition. *Infra*, note 156.

[151] Anders Hansson and Steven McGuire, "Commercial Space and International Trade Rules: An Assessment of the WTO's Influence on the Sector" (1999) 15 Space Policy 199 at 201; *General Agreement on Tariffs and Trade*, 30 October 1947, 55 U.N.T.S. 187, T.I.A.S. 1700 [GATT].

[152] Howard J. Barr, "FCC's New Foreign Access and Satellite Licensing Rules", online: Womble Carlyle <http://www.wcsr.com/>.

affirmatively make an exemption for a specific service if it doesn't want the principle to apply to it. In essence, a State must "opt out" a specific service for a general obligation such as MFN to not apply. The MFN principle requires States to offer the same "deal" given to one State to all other States on a non-discriminatory basis.[154] Thus, under the MFN principle bilateral agreements limiting launch pricing and instituting quotas would no longer be an option. Recognizing this, the US specifically exempted space launch services from the application of the MFN principle to its previous bilateral launch agreements.[155] Similar bilateral agreements for other space services might violate the MFN principle unless the service is exempted by the concerned State.

Market access (guaranteeing access to a domestic market regardless of the mode through which a service is supplied) and national treatment (under which States agree to treat foreign service providers no differently from domestic providers) are, unlike the MFN principle, not general obligations. Therefore, market access and national treatment do not automatically apply to all services. Instead, these two principles require "specific commitments" by a State (on a "schedule") that the principles will apply to a specified service. Essentially this means Parties must explicitly "opt in" specific services to have the two principles apply to those services. In 1997 sixty-nine WTO Member States, including the US, representing over 90% of the world's basic telecommunications revenues, signed the Fourth Protocol to the GATS and made specific commitments

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[153] US, Commission to Assess US National Security Space Management and Organization, *Report of the Commission to Assess US National Security Space Management and Organization, pursuant to P.L. 106-65*,(11 January 2001), online: <http://www.space.gov/doc/fullreport.pdf> at 64 [Space Commission].
[154] Peter Malanczuk, "The Relevance of International Economic Law and the World Trade Organization (WTO) for Commercial Outer Space Activities" (Discussion paper presented to the Third ECSL Colloquium, Perugia, Italy, 6-7 May 1999) [Malanczuk].
[155] For lists of exemptions and commitments, see online: WTO <http://www.wto.org>.

relating to basic telecommunications, including satellite telecommunications.[156] Significantly, no State has made a specific commitment for any of the other space services mentioned herein.[157]

The GATT may also provide challenges to space industries. Under the GATT States will need to be careful about the type and amount of subsidies they provide to space launch vehicle and satellite manufacturing firms. To this point, much State investment in the space industry has been in the form of research and development funding.[158] As such, it may be relatively easy to avoid violating the GATT in the future, since the GATT allows 75% of basic research costs and 50% of applied work costs to be "non-actionable subsidies." However, even in the research-intensive space industry, States must be cognizant of WTO subsidy restrictions or risk potential WTO complaints.

Therefore, in the near term the WTO may not directly impact the commercial space industry, since: in the service sector States may choose to exempt their space services from general obligations and may not make specific commitments, whereas in the trade of goods government subsidies for research and development may be allowed. However, there is another issue raised by the WTO that may become a great source of controversy in the near future, namely the potential use of the national security exception by States to avoid GATT and GATS application to the space industry and space services.

When the GATT was first negotiated in 1947, participating States insisted that a "national security exception" be included to allow them latitude to spend on their armed forces to protect the nation from foreign threats. Not uncommon in multilateral treaties,

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[156] Fourth Protocol to the General Agreement on Trade in Services (WTO 1997), 36 I.L.M. 354 at 366 (1997); Haller and Sakazaki, *supra* note 73.

such exceptions free States of restrictions otherwise imposed by agreements.[159] This national security exception still exists in Article XXI of the GATT, and a similarly worded exception appears in Article XIV *bis* of the GATS.[160] The terms "essential security interests" and "security" have since been subject to broad interpretation. For example, the US has invoked this exception two times -- once to defend the boycott against Cuba and once to defend selective purchasing against Burma -- in part claiming that unilateral sanctions served US security interests by responding to human rights violations committed by the two regimes (*e.g.*, resulting in a heavy influx of refugees from Cuba).[161]

In addition to the lack of clarity in the terms themselves, most industrialized nations take the position that a State's determination of the existence of a national security interest is "self-judging," based exclusively on the discretion of the party invoking the

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[157] Kevin Madders, *A New Force at a New Frontier: Europe's Development in the Space Field in the Light of its Main Actors, Policies, Law and Activities from its Beginnings up to the Present* (Cambridge, Cambridge University Press: 1997) at 560.
[158] US Chamber of Commmerce, *supra* note 142.
[159] Ryan Goodman, *International Human Rights Law in Practice: Norms and National Security: The WTO as a Catalyst for Inquiry* (Spring 2001) 2 Chi. J. Int'l L. 101 at 101 [Goodman].
[160] Wesley A. Cann, Jr, *Creating Standards and Accountability for the Use of the WTO Security Exception: Reducing the Role of Power-Based Relations and Establishing a New Balance Between Sovereignty and Multilateralism* (Summer 2001) 26 Yale J. Int'l L. 413. Article XXI of the GATT says:

> *Nothing in this Agreement shall be construed*
> *(a) to require any contracting party to furnish any information the disclosure of which it considers contrary to its essential security interests; or*
> *(b) to prevent any contracting party from taking any action which it considers necessary for the protection of its essential security interests*
> *(i) relating to fissionable materials or the materials from which they are derived;*
> *(ii) relating to the traffic in arms, ammunition and implements of war and to such traffic in other goods and materials as is carried on directly or indirectly for the purpose of supplying a military establishment;*
> *(iii) taken in time of war or other emergency in international relations; or*
> *(c) to prevent any contracting party from taking any action in pursuance of its obligations under the United Nations Charter for the maintenance of international peace and security.*

The GATS (15 April 1994) has a very similar provision in Article XIV *bis*.

[161] Goodman, *supra* note 159 at 102.

exception, and therefore inherently non-justiciable.[162] Under this view, "[W]ithout a mechanism for a review of such actions, each nation has the sovereign right to define its own national security interests without foreign interference. In effect, it is impossible for a nation to violate article XXI."[163]

Governmental subsidies to and preferential treatment of domestic and "friendly" space industries will no doubt become trade issues in the current competitive market. In such disputes, States will probably invoke the national security exception to escape potential application of WTO principles to their domestic commercial space industries. The growing interdependence between the commercial and military space sectors increases the likelihood that States will invoke this exception. The blurring of lines between national security, economic health, and foreign policy interests cannot but strengthen the resolve of States to avoid the intervention of the WTO. Yet the WTO, perhaps through its dispute resolution process, will almost certainly be involved in these matters.

The pro-competitive, market-opening effects of the WTO telecommunications protocol have sparked increased demands for use of the radio frequency spectrum, with potential impact on national security.[164] As a result of the increased demand, the availability of this limited natural resource may be at risk. At a minimum, the process of allocation, assignment, and coordination of the radio-frequency spectrum may become so complex and time-consuming, resulting in adverse effects on national security,

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[162] *Ibid* at 415. States base this argument on the fact that the national security exception is not listed with other general exceptions (see Article XX of the GATT) that are subject to a limiting introductory clause, and that the use of the term "it considers necessary" gives States more latitude than the "necessary" terminology used elsewhere in the Agreements. The WTO dispute resolution procedure has not yet resolved this issue.
[163] *Ibid.*
[164] Space Commission, *supra* note 153.

particularly as the military increasingly relies on civilian systems that must comply with this process.[165] Disagreement may also arise over military use of "civilian" frequencies. To summarize, armed forces which invest in and rely on commercial services or products that fall under the umbrella of the WTO need to be aware of the WTO "rules" or risk breaking them.

B. Protecting Access to Sensitive Space Technology

1. Export Controls

Another common response of States in defending their space-oriented national security interests is through the imposition of technology transfer restrictions, export controls, and non-proliferation efforts on both multinational and national levels. In this regard, the US export control regime is singularly comprehensive and is discussed below, following a brief overview of the multinational regime.[166]

On the multinational level, there are two primary technology control regimes relevant to space systems: the Missile Technology Control Regime (MTCR) and the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies (Wassenaar Arrangement).[167] There are currently 33 Partner States in the MTCR and several other States (including China and Israel) have pledged to adhere to the MCTR without formally joining the Regime. The goal of the MTCR, which was

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[165] *Ibid.*

[166] A brief summary of the export control regime with the greatest impact on commercial space technologies follows; a *detailed* description is beyond the scope of this paper.

[167] The Wassenaar Arrangement, named after the suburb of The Hague, Netherlands where the initial agreement was reached, was approved by its 33 founding countries in July 1996 and currently operates through a permanent secretariat in Vienna, Austria. See online: US DOC Bureau of Industry and Security <http://www.bxa.doc.gov/Wassenaar/> and Wassenaar homepage <www.wassenaar.org>; *Canada-France-Federal Republic of Germany-Italy-Japan-United Kingdom-United States: Agreement on Guidelines for*

established in 1987, is to restrict the proliferation of missiles capable of carrying weapons of mass destruction (WMD). Space launch vehicles are considered "missiles" and are therefore covered by the MTCR. The MTCR is a voluntary arrangement – it is not a formal international agreement. Accordingly, each Partner State implements the Regime on a national level through its own national export control regulations.[168] In an attempt to more effectively enforce the Regime, the US Congress passed a law in 1990 mandating the imposition of economic sanctions against countries which export covered technologies to non-MTCR nations.[169] Since this law went into effect, the US has at various times imposed such sanctions against China, India, Iran, North Korea, Pakistan, Russia, South Africa, and Syria. To further strengthen compliance with the Regime, in 1994 the Partner States agreed to a "no undercut" policy for denied export licenses. Under this policy, if one Partner State denies export of a covered technology to a specific country, the other MTCR Partners are also expected to deny the export.[170]

The MTCR is not designed to impede national space programs or international cooperation in space. Hence, space launch vehicles may be transferred to other MTCR Partner States if sufficient assurances are given about the proper use of the launch vehicle by the recipient State. However, in the past such transfers have been the source of great controversy, with some Partner States criticizing others for transferring technology

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the Transfer of Equipment and Technology Related to Missiles, 26 I.L.M. 599 (1987) [*The Missile Technology Control Regime (MTCR)*].

[168] Lora Lumpe, "The Missile Technology Control Regime," online: Federation of American Scientists <http://www.fas.org/nuke/control/mtcr>.

[169] Title XVII, *Missile Technology Controls, National Defense Authorization Act for FY 1991*, Pub. L. No. 101-510 (1990).

[170] *Ibid.*

despite suspicion that the recipient country is trying to get launch vehicle technology to use for ballistic missile development.[171]

The other major international export control regime affecting space technology is the Wassenaar Arrangement, designed to complement the MTCR by controlling conventional arms transfers and dual use technologies. As is the case with the MTCR, enforcement of the Wassenaar Arrangement is left to Participating States through national laws.[172] The Wassenaar Arrangement is the successor to the 1949 Coordinating Committee on Multilateral Export Controls (COCOM), which was a joint organization of the NATO countries, Japan, and Australia formed to prevent the sale of weapons and technology to the Soviet Union and communist bloc nations. COCOM was disbanded in 1994 following the dissolution of the Soviet Union, the opening of Eastern European markets, and the end of the Cold War.[173] One of the key differences between COCOM and Wassenaar is that Russia is a participant in, rather than a target of, the regime.[174]

The Wassenaar Arrangement was created in 1996 to deny trade of conventional arms and sensitive technologies to States that pose security risks (based on location in an unstable region or threatening behavior) and to increase transparency in the global market for these goods.[175] However, it has been criticized as being weak, mainly for its lack of a veto mechanism to prohibit the transfer of technology to a non-member State. Incredibly,

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[171] Wyn Q. Bowen, "US Policy on Ballistic Missile Proliferation: The MTCR's First Decade (1987-1997)" (Fall 1997) 51 The Nonproliferation Review 21 at 45. The US and France had conflict over France's proposed transfers of technology to Brazil and India, for example. *Ibid.*
[172] Ram Jakhu and Joseph Wilson, "The New United States Export Control Regime: Its Impact on the Communications Satellite Industry" (2000) 25 Ann. Air & Sp. L. 157 at 163 [Jakhu and Wilson].
[173] Ronald J. Sievert, "Urgent Message to Congress - Nuclear Triggers to Libya, Missile Guidance to China, Air Defense to Iraq, Arms Supplier to the World: Has the Time Finally Arrived to Overhaul the U.S. Export Control Regime? The Case for Immediate Reform of Our Outdated, Ineffective, and Self-Defeating Export Control System" (Winter 2002) 37 Tex. Int'l L.J. 89 [Sievert].
[174] Jakhu and Wilson, *supra* note 172.
[175] Sievert, *supra* note 173.

the combination of the Arrangement's "no undercut" provisions means that members who deny export are essentially forced to notify all other members that there may be an export opportunity available to them. The other members may therefore undercut the earlier denial because they do not have to report their undercut to the denying State until *after* they have already granted the export license.[176] As such, the Arrangement has been criticized as being little more than an *ex post facto* reporting system that creates a dilemma for policy makers.[177]

Often criticized for its complexity, the current US export control regime reflects the climate in which it has evolved – the climate of conflict between "pro-business" and "pro-national security" advocates.[178] At the national level in the US, the Department of Commerce (DOC) and the Department of State (DOS) are primarily responsible for licensing the export of strategic goods, including space technologies. The DOS deals with those technologies which are inherently military, while the DOC is concerned with dual use items.[179] The Export Administration Act (EAA) and the Arms Export Control Act (AECA) are the main statutes in the US export control regime.[180]

Through the AECA, the DOS licenses the commercial export of exclusively military items and related technical data. Promulgated by the DOS, the International Traffic in Arms Regulations (ITARs) are the implementing regulations for the AECA. Items such as weapons, ammunition, and civilian articles designed, adapted, or modified for military or intelligence uses are monitored and controlled if they are included on the United States

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[176] Jamil Jaffer, "Strengthening the Wassenaar Export Control Regime" (Fall 2002) 3 Chi. J. Int'l L. 519 at 522.
[177] Sievert, *supra* note 173.
[178] Jere W. Morehead and David A. Dismuke, "Export Control Policies and National Security: Protecting U.S. Interests in the New Millennium" (Spring 1999) 34 Tex. Int'l L.J. 173.
[179] *Ibid.*
[180] *EAA of 1979*, Pub. L. No. 96-72, 93 Stat. 503 (1979); *AECA*, 22 USC §2778.

Munitions List (USML).[181] Effective 15 March 1999, commercial satellites were placed on the USML (under the AECA) and therefore require DOS approval for export. The 1999 law also requires the DOD to approve any satellite export.[182]

The EAA is the statute through which the DOC licenses exports of non-military, dual use technology.[183] The technologies covered under the EAA include many difficult-to-classify, dual use items (which may or may not also be regulated under the AECA), listed on a lengthy, very technical Commerce Control List (CCL) that covers such items as high-speed computers, navigation devices, and other items which have potential military and civilian application with little or no modification.[184] A result of continued disagreement over export controls, the EAA lapsed again in August 2001 but, as has been the case on many occasions in the recent past, the export control system is being kept alive by Presidential invocation of emergency powers.[185] A proposed 2001 EAA would have included stiffer penalties for EAA violations, while at the same time including a mass-market exemption for technologies

> *"that you may be able to buy . . . at Radio Shack that may have defense implications. If you can buy it at Radio Shack, so can anybody else. If*

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[181] Sievert, *supra* note 173. Within the DOS, the Office of Defense Trade Controls (DTC) monitors and control the shipment of items on the United States Munitions List (USML). The USML contains twenty-one categories ranging "from those unambiguously confined to military use, like Category II-'Artillery Projectors', to some that can encompass items with civil application, like Category XV-Spacecraft Systems and Associated Equipment."

[182] Jakhu and Wilson, *supra* note 172.

[183] *Ibid.* The EAA is implemented by the Export Administration Regulations (EAR), through the DOC's Bureau of Industry and Security (BIS). Until April 2002, the BIS was called the Bureau of Export Administration (BXA).

[184] Sievert, *supra* note 173 (also noting there are many other US statutes and implementing regulations that directly or indirectly impact exports and, notably, may conflict with the EAR and the AECA. For example, the *Trading with the Enemy Act* (TWEA), *International Emergency Economic Powers Act* (IEEPA), *Anti-Terrorism and Effective Death Penalty Act* (AEDPA), *Nuclear Non-Proliferation Act* (NNPA), and various U.S. Treasury directives (*e.g.*, the Office of Foreign Assets Control (OFAC))).

[185] US Department of Commerce Bureau of Industry and Security, "Streamlining and Strengthening Export Controls," online: DOC's BIS <http://207.96.48.13/eaa.html>. The Presidential emergency powers were declared under the International Emergency Economic Powers Act.

something is mass-marketed -- as much as you might want to keep that technology from falling into the wrong hands -- the bottom line is, once it is sold on a mass-marketed basis, you're wasting your time in trying to protect that technology."[186]

2. Tensions between Competition and National Security

As discussed previously, export licenses afford the US great control over the transfer of potentially militarily useful technology (even if transferred for the sole purpose of being launched overseas), since many satellites and satellite components are manufactured in the US.[187] Ironically, although the US is the world's greatest importer and exporter, the US still has some of the strictest unilateral export controls in the world.[188] Despite this, many politicians and members of the DOD have expressed fear that US national security "is being sacrificed at the altar of commerce."[189]

Two situations in particular contributed to the view that US companies transfer too much militarily useful technology to foreign countries: the Cox Committee,[190] which investigated allegations of technology transfer to China, and the Boeing (Sea Launch) investigation with its allegations of technology transfer to Russia and the Ukraine. The repercussions from these incidents are still being felt by US companies today, in the form of expensive sanctions and more restrictive export control laws.[191]

In 1995 and 1996 two Chinese launches of satellites built by US manufacturers (Hughes and Loral) failed, destroying the satellites and injuring and killing many people

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[186] Statement of US Senator Phil Gramm, chairman of the Senate Committee on Banking, Housing and Urban Affairs, announcing the introduction of the proposed EAA of 2001 (23 January 2001), online: Senate <http://banking.senate.gov/docs/eaa/statmnts.htm>.
[187] van Fenema, *supra* note 127.
[188] Broadbent, *supra* note 90.
[189] *Ibid.*
[190] *The Cox Committee on US National Security and Military/Commercial Concerns with the People's Republic of China* [*Cox Committee*].
[191] *Ibid.*

on the ground.[192] The companies inquired into the launch failures at the request of their insurance companies, who wanted to be certain about the causes of the failures. The companies participated in the investigations but failed to get an approved export license to do so. As a result, the Justice Department investigated the alleged transfer of technical data during the course of the insurance investigation. Subsequently in 1998 the House of Representatives formed the Cox Committee[193] to address the alleged export violations. The investigations found that both companies deliberately and improperly transferred technology to China. Ultimately, the companies paid vast settlements to the US government.[194]

In 1997 Boeing officials became concerned that they too had violated procedures relating to the handling of missile technology through their involvement in the Sea Launch joint venture.[195] They were concerned the mishandled technical information could potentially be used by their Russian and Ukrainian partners. After an investigation by the US Department of State, Boeing was fined $10 million.[196]

These two incidents resulted in stricter export control laws, which US companies have since argued hurt their competitiveness in the global market.[197] The private sector often complains that these export control laws only delay the inevitability that States will receive the denied technology, and therefore that they merely hurt the private sector's market competitiveness in the meantime. They argue that, if the relevant technology is

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[192] Kempton and Balc, *supra* note 95.
[193] *Cox Committee, supra* note 190.
[194] On 9 January 2002 Loral settled for $20 million. On 5 March 2003 Hughes (and Boeing, who purchased Hughes Space and Communications Company from Hughes Electronics) settled for $32 million. *Supra*, note 192; Sam Silverstein, "Boeing, Hughes Agree to Pay $32 Million for China Export Violations" *Space News* (5 March 2003); Smith, *Space Launch Vehicles, supra* note 19 at 12.
[195] Kempton and Balc, *supra* note 95.
[196] *Ibid.*

"readily available" overseas, US companies should also be able to make the sale.[198] However, the loudest complaint is that the export approval process for satellites now takes too long. Between 1992 and 1996, the supposedly market-oriented Commerce Department was responsible for satellite export decisions. However, after the technology transfer scares in the China and Sea Launch incidents, Congress transferred export control authority back to the presumably more security-minded State Department.[199] US satellite manufacturers relate horror stories about the resulting loss of business, citing examples of foreign companies avoiding business with US firms due to the notorious, lengthy export approval process.[200] The issue of agency jurisdiction over these export decisions is still controversial.

The Cox Report sparked other changes to export control legislation, as well. For example, DOD now must monitor every single contact between foreign launch services and US satellite manufacturers.[201] The intelligence community also plays a larger role in export decisions. Also, Congress must be notified about ongoing investigations.[202]

Some of the controversy surrounding the post-Cox Report legislation has to do with the belief that the new regulations are being enforced too strictly against non-Chinese exports and hurting business with allies, as well. Even DOD officials have expressed concern about long-term irrecoverable harm to the US space industry as a result of stifled exports.[203] Some of these concerns have been addressed -- for example, exports to

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[197] Smith, *Space Launch Vehicles*, *supra* note 19 at 13 (citing *FY2000 DOD Authorization Act* (Pub. L. No. 106-65)).
[198] Sievert, *supra* note 173.
[199] Zaborsky, *Export Policy*, *supra* note 94 at 57; *FY1999 DOD Authorization Bill*, Pub. L. No. 105-261.
[200] Patrick A. Salin, *An Overview of US Commercial Space Legislation and Policies – Present and Future* (June 2002) 27:3 Ann. Air & Sp. L. 209 at 217. One example is Canada's RADARSAT II.
[201] Zaborsky, *Export Policy*, *supra* note 94 at 57.
[202] Smith, *Space Launch Vehicles*, *supra* note 19 at 13.
[203] *Ibid.*

France, NATO allies, and (ironically) Russia, Ukraine, and Kazakhstan now receive expedited export control consideration.[204] These incidents perfectly illustrate the delicate balance a State must maintain to, on the one hand, strengthen domestic industry through global cooperation and on the other, to protect sensitive technology.

C. Protecting Space Assets: The Potential Use of Force in Space

Thus far the discussion has centered on States ensuring they have reliable access to space, primarily by maintaining their own healthy domestic space industries, or nations denying access to space to others through non-proliferation and export controls. At the same time, States have developed various means to protect the space assets on which they rely. For example, satellites are hardened or shielded to protect them from naturally occurring radiation and from electromagnetic pulses. Satellites are often maneuverable, mainly for accurate positioning but potentially also to avoid collisions with space debris and other satellites and to protect them in the future from space weapons. Satellites also have redundant components in case of failure. Further, signals sent to and from satellites may be encrypted to lessen the likelihood of spoofing,[205] interception, or jamming.[206] In addition, the ground segment, including launch platforms and communications links, is protected by physical barriers and armed forces.[207]

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[204] *Ibid.*

[205] Spoofing means transmitting false commands to a satellite. Paul B. Stares, "The Problem of Non-Dedicated Space Weapon Systems" in Bhupendra Jasani, ed., *Peaceful and Non-Peaceful Uses of Space: Problems of Definition for the Prevention of an Arms Race* (New York: Taylor & Francis, 1991).

[206] Jamming is the emission of noise-like signals to mask or prevent reception of signals. GAO Report on Satellite Security, *supra* note 29.

[207] Robert McDougall and Phillip J. Baines, "Military Approaches to Space Vulnerabilities: Seven Questions" in Moltz, James Clay, ed., *Future Security in Space: Commercial, Military, and Arms Control Trade-Offs* (Center for Nonproliferation Studies, Monterey, California: 2002).

Assuring a nation's access to space while simultaneously denying adversaries the use of space has in recent years been called "space control."[208] In the past, anti-satellite (ASAT) weapons were seen as the key to denying adversaries the use of space, since the very purpose of an ASAT is to destroy or incapacitate other satellites in orbit. However, recent years have seen the US DOD developing other means to deny the use of space to adversaries, such as jamming, spoofing, and making ground communications links, control centers, and launch pads inoperable. As recently as 2001 the head of the US Space Command expressed concern about using kinetic energy ASATs, since the debris left in orbit from the use of these weapons could damage friendly satellites, civilian and military, belonging to the US and its allies.[209] Accordingly, instead of concentrating on ASAT technology as the centerpiece of its space control effort, recently the US has been funding alternative space control technologies.[210]

While both the US and the former Soviet Union have occasionally tested anti-satellite (ASAT) weapons and in the past have also developed and tested anti-ballistic missile (ABM) defenses,[211] for forty-five years the major powers have, for the most part, refrained from deploying capabilities for armed conflict in space. However, that may change in the not too distant future, as the US for one is actively pursuing a ballistic

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[208] Smith, *US Space Program*, *supra* note 20 at 12; *Space Policy*, *supra* note 11 (defining "space control" as "ensur[ing] freedom of action in space for the United States and its allies and, when directed, deny[ing] an adversary freedom of action in space." This mission includes surveillance, protection, prevention, negation, and direct support.

[209] *Ibid.* A kinetic energy ASAT would physically hit a target to destroy it.

[210] *Ibid.* The 2003 budget includes $13.8 million for these space control technologies and $40 million for "counterspace systems," a program which effectively moves some space control programs into the engineering and manufacturing development phase. DOD has requested $14.7 million for space control and $82.6 million for counterspace systems in the 2004 budget.

[211] Bhupendra Jasani, ed., *Peaceful and Non-Peaceful Uses of Space: Problems of Definition for the Prevention of an Arms Race* (New York: Taylor & Francis, 1991) at 2; John M. Logsdon, "What Path to Space Power" (Winter 2003) Joint Forces Quarterly, online: GWU Space Policy Institute <http://www.gwu.edu/> [Logsdon, "What Path"].

missile defense system capable of intercepting missiles of different ranges in all phases of flight. According to a White House press release of May 2003,[212] systems planned for operational use in 2004 and 2005 include ground- and sea-based missile interceptors using land-, sea-, and space-based early warning sensors and radars. Potential future system upgrades include a planned airborne laser. Development of hit-to-kill (kinetic energy) interceptors based on the ground, sea, and air to destroy missiles in the boost and midcourse phases of flight continues. The US is also attempting to develop, as part of its missile defense program, space-based weapons capable of destroying missiles in the boost phase of flight.[213] One such project is a space-based laser (SBL), and another a kinetic energy weapon designed to physically hit a targeted ballistic missile in its boost phase and destroy it.[214]

Despite the recent shift in focus from ASATs to alternative space control methods and ballistic missile defense, it is possible that the future will see States protecting their own space assets or attacking enemy assets from, in, or through space using force. The debate about whether space should be weaponized has been extremely controversial. US ballistic missile defense efforts have prompted many States and international non-governmental organizations to urge a ban on an arms race in outer space. This issue has been on the agenda of the United Nations (UN) Conference on Disarmament since the

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[212] US White House, Press Release, "National Policy on Ballistic Missile Defense Fact Sheet" (20 May 2003) online: White House <http://www.whitehouse.gov/news/releases/2003/05/20030520-15.html>. The boost phase is the time from launch of a missile until burnout, which is still prior to the deployment of warheads or defensive countermeasures. Depending on the range of the missile, boost phase may stop in or continue out of the earth's atmosphere. The midcourse phase, during which the missile is no longer firing its propulsion system and is coasting toward its target, is the longest portion of a missile's flight. For an ICBM, this phase can last up to 30 minutes. For longer-range missiles this phase occurs outside the earth's atmosphere. For more details see the Raytheon website online: Raytheon <http://raytheonmissiledefense.com/phases/#boost>.

[213] Smith, *US Space Program*, *supra* note 20.

mid-1980s without agreement, because the Conference requires the consent of all participants to take action and the US, supported by the United Kingdom and Germany, opposes the effort. In addition, since 1994 the UN General Assembly has passed a total of ten resolutions calling on States to prevent an arms race in outer space. No State has ever voted against these resolutions and very few nations (e.g., the United States and Israel) abstain from voting.[215]

Essentially, there are two primary views concerning space weaponization[216] -- there are those who believe that space is merely another theater of military operations, offering strategic advantages in which weapons should be deployed; opposing this view are those who believe that only stabilizing military uses of space (such as monitoring compliance with arms control agreements and early warning) should be allowed.[217] The advocates of weaponization of space believe that States will develop either defensive systems to defend their valuable space assets or offensive systems to deny an enemy's access to their valuable space assets. They further note that, once developed and deployed, space weapons could be used for either purpose, whether designed to be defensive or offensive. These experts cite the evolution of the use of space assets from indirect military support (such as reconnaissance) to direct support of ground-based weapons systems (such as GPS-guided bombs) as proof that the use of space assets as

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[214] *Ibid.*
[215] Logsdon, "What Path," supra note 211 at 8. For a list of these resolutions and the votes, see online: UN Vienna, Office for Outer Space Affairs <http://www.oosa.unvienna.org/SpaceLaw/gares/index_pf.html>.
[216] Peter L. Hays, "Military Space Cooperation: Opportunities and Challenges" in Moltz, James Clay, ed., *Future Security in Space: Commercial, Military, and Arms Control Trade-Offs* (Center for Nonproliferation Studies, Monterey, California: 2002) at 32 [Hays].
[217] George and Meredith Friedman, *The Future of War* (New York, St. Martin's Press: 1996) at 333 [Friedman]; US, Commission to Assess US National Security Space Management and Organization, *Report of the Commission to Assess US National Security Space Management and Organization, pursuant to P.L. 106-65*,(11 January 2001), online: <http://www.space.gov/doc/fullreport.pdf> at 64 [Space Commission].

weapons platforms is the next natural step.[218] On the other hand, there are also those who argue that space powers should refrain from developing space weapons, since militarily those States have the most to lose by weapons in space.[219] A recent analysis stresses the growing importance of commercial space assets (both to national economies and to armed forces) as the strongest argument against weaponization of space, arguing that a stable, weapon-free space environment is in best interests of those nations who heavily rely on commercial satellites.[220] The same source points out that private investors may hesitate to invest in space ventures given weapons-related risks on top of inherent technical hurdles. Perhaps surprisingly, the policy advocating the placing of weapons in outer space does not enjoy unanimous support among the US military. Some US officers on active duty believe space should not be weaponized, both for practical and moral reasons.[221] The legal implications of and restrictions on the use of weapons in space will be discussed *infra* at Section V.

D. Protecting Access to Space Services

States protect access to the services they rely on for national security, even when those services are provided by commercial entities. However, it is important to realize that imposing military and national security requirements (and therefore costs) on commercial entities struggling for survival in a competitive market has been criticized: "It is also important that military requirements should not be imposed on shared

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[218] Friedman, *ibid.* at 331.
[219] Hays, *supra* note 216 at 33.
[220] Charles V. Pena, "US Commercial Space Programs: Future Priorities and Implications for National Security" and Alain Dupas, "Commercial-Led Options" in Moltz, James Clay, ed., *Future Security in Space: Commercial, Military, and Arms Control Trade-Offs* (Monterey, California: Center for Nonproliferation Studies, 2002) [Pena].
[221] See *e.g.*, Charles J. Dunlap, Jr., "Technology: Recomplicating Moral Life for the Nation's Defenders" (Autumn 1999) Parameters 24.

nonmilitary satellites . . . Neither commercial satellite operators nor the other users of commercial satellites should shoulder any cost burdens imposed by the military . . ."[222]

1. Launching Facilities and Services

The strongest control governments currently maintain over military and commercial launches is ownership of launch facilities. In the US, for example, federal launch ranges support both government and commercial launches.[223] The importance of commercial launches to US government launch facilities is evident in the ongoing effort to upgrade and modernize these facilities. These upgrades are a combined commercial, federal, and state government effort, and commercial sector requirements are specifically being considered in the modernization process.[224] While commercial entities have been granted permission to use US government launch facilities on a reimbursable basis, the US government retains the right to use the facilities on a priority basis to meet national security demands.[225]

In addition, it is US policy that US government satellites be launched on US launch vehicles unless the President grants a waiver.[226] For example, Pratt and Whitney, a division of United Technologies Corporation, had to obtain a waiver to use a Russian-built engine on the new Atlas 5 EELV for planned government launches.[227] Since the French Arianespace does not have a similar written policy requiring European States to use *Ariane* for their governmental satellites, it wants the US restriction lifted. Even

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[222] Pena, *supra* note 220 at 10.
[223] US FAA, *2003 2nd Quarter Report*, online: FAA <http://ast.faa.gov> at 42 [FAA 2nd Quarter Report].
[224] *Ibid.* In January 2002 the AF, DOC, and FAA established the means to collect and incorporate commercial sector requirements into launch infrastructure modernization efforts. See online: FAA <http://ast.faa.gov>.
[225] *Space Policy*, *supra* note 11.
[226] Smith, *US Space Programs*, *supra* note 20 at 13.
[227] FAA 2nd Quarter Report, *supra* note 223.

though the European Space Agency (ESA) does give a preference to Arianespace for its own launches, there are no legal obstacles to the ESA using other launch vehicles.[228]

Of the ELVs available in the US, three are restricted to government payloads.[229] The Russian and Ukraine-built Zenit 3SL launcher, although used by Sea Launch and available in the US, is restricted to civilian payload launches. The remaining five of the ELVs available in the US may be used for either governmental or civilian payloads.[230] In the future, the DOD reportedly plans to use as many private sector launch service providers as possible to save money.[231]

Although the number of private and state "spaceports" is growing, States may ensure the ability to address national security concerns at these non-federal facilities through the licensing process. In the US, for example, the Federal Aviation Administration's Associate Administrator for Commercial Space Transportation (FAA/AST) regulates commercial space launch activities and has the explicit mission "to ensure public health and safety and the safety of property while protecting the national security and foreign policy interests of the United States during commercial launch and reentry operations."[232] Any non-federal entity must get a license from FAA/AST to operate a launch site in the US. The first such non-federal launch was 6 January 1998, when NASA's Lunar Prospector was launched from the Florida Spaceport on a Lockheed Martin Athena launcher. Notably, this launch illustrates that in the US non-federal facilities and

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[228] Smith, *Space Launch Vehicles, supra* note 19 at 8.
[229] The Minotaur, Titan 2, and Titan 4B launchers. FAA 2nd Quarter Report, *supra* note 223 at 14.
[230] Athena, the Atlas family, the Delta family, Pegasus, and Taurus. *Ibid.*
[231] Nick Mitsis, "The Military's Increased Interest in Commercial Launchers" *Defense Daily* (2003), online: Defense Daily <http://www.defensedaily.com/reports/satcom_3.htm>.
[232] See the FAA 2003 2nd quarter report, *supra* note 223 (citing Executive Order 12465 and 49 USC Subtitle IX, Chapter 701 (formerly the *Commercial Space Launch Act*)).

launchers are also used for governmental payloads.[233] For commercial FAA-licensed launch operations, a Memorandum of Agreement (MOA) sets out the terms of governmental involvement, including provisions that the government will "not preclude or deter commercial space sector activities, except for public safety or national security reasons." The MOA (which governs the behavior of the DOD, the FAA, and NASA) also requires the agencies to first consider the availability of domestic, non-federal launch facilities for commercial launches before making federal launch property or services available.[234] Thus, the MOA itself evidences the goal of protecting national security interests both through licensing and by promoting the domestic space industry.

2. Communications

About 60 percent of the satellite communications used by the US military are provided by commercial entities.[235] These services are leased by the Defense Information Systems Agency's (DISA) Commercial Satellite Communications Branch. In addition, other US government agencies lease commercial satellite communications services (e.g., the Secret Service, the FAA, NOAA, and the National Weather Service). Governmental agencies which rely on commercial satellites attempt to lessen the risks of relying on satellites they do not control by specifying availability and reliability requirements in the lease contracts.[236]

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[233] *Ibid.* at 48.

[234] *Memorandum of Agreement among Department of Defense, Federal Aviation Administration and National Aeronautics and Space Administration: on Federal Interaction with Launch Site Operators* (September 1997), online: FAA <http://ast.faa.gov/files/pdf/moa-1997.pdf>. Other MOAs, licensing information, reports, and regulations are available on this site, as well.

[235] Katie McConnell, "Military Satellite Communications: The March Toward Commercialization" *Defense Daily* (2003), online: Defense Daily <http:www.defensedaily.com/reports/sitcom_4.htm>.

[236] US General Accounting Office (GAO), Report to the Ranking Minority Member, Permanent Subcommittee on Investigations, Committee on Governmental Affairs, U.S. Senate, *Critical Infrastructure Protection: Commercial Satellite Security Should Be More Fully Addressed* (August 2002), GAO-02-781 at

The most visible example of such a lease for US military communications is the DOD's wireless global communications agreement with Iridium Satellite, Limited Liability Company. Salvaging the bankrupt company, the DOD signed an initial two-year unlimited access agreement in 2000. General Dynamics created a special encryption service and built a gateway in Hawaii to connect calls. The annual $36 million contract was renewed in 2002.[237]

In order to assure contractually-mandated reliability and availability levels, commercial service providers usually must maintain at least minimal security controls. Common types of security controls are: encryption of data links (uplinks to, downlinks from, and crosslinks between satellites), high-power radio frequency uplinks,[238] and spread spectrum communication.[239] However, in general federal officials cannot mandate that commercial providers use a specific security technique, and US government policy addressing commercial satellite communication security is not well developed.

Current US policy is established by National Security Telecommunications and Information Systems Security Policy (NSTISSP) 12, *National Information Assurance (IA) Policy for US Space Systems.*[240] NSTISSP 12 requires encryption approved by the National Security Agency (NSA) for certain satellite systems. However, the policy is limited in application since: it only applies to US government or US commercial space

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29, online: Defense Daily <http://www.defensedaily.com/reports/101102fully.pdf> [GAO Report on Satellite Security].

[237] Simon Romero, "Military Now Often Enlists Commercial Technology" *The New York Times* (10 March 2003) C-1.

[238] High-power uplinks use a large antenna to send a high-power signal from the ground station to the satellite, so that an attacker would have to have a powerful radio transmitter and sophisticated technical knowledge to intentionally interfere with the link. *Ibid.*

[239] Spread spectrum technologies are most often used by military but not commercial systems. Because the frequency of the transmitted signal is spread over a wide band, jamming attempts require higher power, assuming the signal is detected at all. *Ibid.*

systems that are used for "national security" purposes; it addresses only security techniques over communications links to, from, and between satellites; and it has no enforcement mechanism to ensure compliance.[241] In addition, "national security" systems are narrowly defined as those that either contain classified information, or:

(1) involve intelligence activities (including imagery systems that are or could be used for national security),

(2) involve cryptographic activities related to national security,

(3) involve command and control of military forces,

(4) involve equipment integral to weapons, or

(5) are critical to the direct fulfillment of military or intelligence missions.

Hence, routine administrative uses and even sensitive information that does not fit the "national security" definition are not covered.[242] Despite consistent resistance of the commercial satellite industry to voluntarily comply with NSTISSP 12 requirements for business reasons (namely associated cost and complexity of satellites and ground systems), DOD officials have drafted a policy that would require all satellite systems used by DOD to meet these requirements and would require a waiver prior to DOD use of a non-compliant system.[243]

States also address satellite communication national security concerns through foreign ownership limitations for entities engaged in telecommunications. In the US for example, the *Communications Act of 1934* and recent US WTO commitments contain

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[240] National Security Telecommunications and Information Systems Security Policy (NSTISSP) 12, *National Information Assurance (IA) Policy for U.S. Space Systems* (January 2001), online: Committee on National Security Systems (CNSS) <http://www.nstissc.gov/html/overview.html>.
[241] GAO Report on Satellite Security, *supra* note 236.
[242] See online: Committee on National Security Systems (CNSS) <http://www.nstissc.gov/html/overview.html>.

[243] GAO Report on Satellite Security, *supra* note 236.

foreign ownership limitations for telecommunications providers.[244] In addition, foreign entities, during the licensing process, have been required to submit to certain conditions governing their telecommunications operations in the US. Examples of such conditions have included: construction of a gateway in the US so that wiretaps can be carried out, limitations on foreign access to certain information, citizenship requirements, reporting requirements, and disclosure requirements for personal data about personnel occupying sensitive positions. In May 2000, the President's National Security Telecommunications Advisory Committee stated the "current regulatory structure effectively accommodated increasing levels of foreign ownership of United States telecommunications facilities, while allowing the Federal Government to retain authority to prevent any such foreign ownership that might compromise national security interests."[245]

3. Remote Sensing/Earth Observation by Satellite

Due to the military usefulness of high-resolution imaging of the earth, States protect their national security interests in remote sensing from space through regulations aimed

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[244] *Communications Act of 1934*, as amended by the *Telecommunications Act of 1996*, Pub. L. No. 104-104, 110 Stat. 56. This Act provides at 47 U.S.C. §310(b) that no licenses for broadcast stations or carriers will be granted to:

> *(1) any alien or the representative of any alien;*
> *(2) any corporation organized under the laws of any foreign government;*
> *(3) any corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country;*
> *(4) any corporation directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof, or by any corporation organized under the laws of a foreign country, if the Commission finds that the public interest will be served by the refusal or revocation of such license.*

For lists of WTO commitments, see online: WTO <http://www.wto.org>.

[245] Haller and Sakazaki, *supra* note 73.

both at the operation of the satellites and at the collection and distribution of the data. At the international level, the UN General Assembly Resolution on the Principles of Remote Sensing[246] does not directly address national security concerns. The Resolution is silent with regard to military remote sensing, the end result of controversy during its drafting in the UN Committee for the Peaceful Uses of Outer Space (COPUOS).[247] The final text of the Resolution was a compromise between, on the one hand, developing and socialist countries arguing that a sensed State should have the right to approve the distribution of data concerning it and, on the other hand, the US and most other western States contending that there should be no restrictions on the collection and dissemination of data.[248] Because of these and other irreconcilable differences, the compromise principles were eventually adopted in the form of a non-binding General Assembly resolution rather than as a treaty. As a result, the resolution merely establishes the principle of "openness" for many civilian uses of remote sensing by satellite: freedom of collection and dissemination of data without the prior consent of sensed States, but balanced by a principle that sensed States may have access to certain types of data on a priority basis if they pay for it.[249] In essence, the Resolution may be viewed as a weak expression of

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[246] *United Nations Principles Relating to Remote Sensing of the Earth from Outer Space*, GA Res. 41/65 (XLII), UNGAOR, 29 Sess., 95th Plen. Mtg., UN Doc A/RES/41/65 (1987)(adopted without vote on 3 December 1986) [Remote Sensing Principles].

[247] Gabriella Catalano Sgrosso, *International Legal Framework of Remote Sensing* (2001); Wulf von Kries, "Towards a New Remote Sensing Order?" (2000) 16 Space Policy, online: Elsevier <http://www.elsevier/com/locate/spacepol at 164>; Stephen Gorove, "The UN Principles on Remote Sensing: Focus on Possible Controversial Issues" (Paper presented at McGill Symposium)(published in N.M. Matte and H. DeSaussure, eds, *Legal Implications of Remote Sensing from Outer Space* (1976)) at 106. The COPUOS has no authority to deal with military issues.

[248] Nandasiri Jasentuliyana, *International Space Law and the United Nations* (The Hague, Kluwer Law: 1999) at 314.

[249] M. Lucy Stojak, "Recent Developments in Space Law" in J. Marshall Beier and Steven Mataija, eds., *Arms Control and the Rule of Law: A Framework for Peace and Security in Outer Space* (Proceedings of the Fifteenth Annual Ottawa NACD Verification Symposium) (Toronto: York University, 1998).

unenforceable platitudes;[250] hence, it does not place any meaningful restraints on the use of remote sensing technology by the military.

As armed forces increasingly rely on civilian commercial remote sensing systems, nationally enacted rules affecting those commercial systems cannot but have an impact on national security interests. The failure of Member States of COPUOS to adopt, instead of a resolution, a set of binding international regulations governing remote sensing from space, coupled with commercialization of the satellite remote sensing sector, has led States to regulate the use of this technology in accordance with their national interests. Some critics complain that domestic regulation, enacted by States in part to address national security concerns, weakens the overall "openness" principle.[251] Such national efforts include additional licensing restrictions, so-called "shutter control," and specific collection and dissemination restrictions.

As mentioned previously, licensing restrictions and conditions are a powerful tool for States to address national security concerns, and US remote sensing operators may need three or even four different licenses due to the sensitivity of their operations.[252] Before being granted a remote sensing license, the Secretary of Defense must determine that, among other things, the applicant will comply with any national security concerns of the US. Further, all remote sensing operators are required to keep a record of all satellite taskings in the previous year and give the US Government access to these records.[253] In

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[250] For a contrary view that the Resolution codifies customary legal principles that are binding on States and as a practical matter have been implemented in domestic regulations, see Gabrynowicz, *infra* note 251.
[251] Joanne I. Gabrynowicz, *Expanding Global Remote Sensing Services: Three Fundamental Considerations* (Paper presented to the International Institute of Space Law at the Third United Nations Conference on the Peaceful Uses of Outer Space (UNISPACE III), Vienna, Austria, 21 July 21 1999) at 98 [Gabrynowicz, *Expanding Remote Sensing*].
[252] Michael R. Hoversten, *U.S. National Security and Government Regulation of Commercial Remote Sensing from Outer Space* (2001) 50 A.F. L. Rev. 253 at 267.
[253] *Ibid.*

addition, other national security-based licensing restrictions include a requirement that operational control of the system be maintained within the US and that the operator notify the US Government of any significant agreements with foreign entities. Other licensing restrictions may be imposed for national security reasons as well. For example, Space Imaging Company's 0.5-meter resolution system has been subject to a licensing restriction that requires a 24-hour delay between image acquisition and release.[254] As the ultimate control mechanism, the remote sensing license may be terminated, modified, or suspended for failure to comply with national security concerns.[255] However, despite these restrictions, since 1994 about one dozen remote sensing companies have applied for and been granted licenses.[256]

One of the most controversial restrictions on remote sensing operators is so-called "shutter control." Implemented as a licensing condition, shutter control requires remote sensing operators to agree to limit data collection and/or distribution if the US government deems it necessary to meet national security or foreign policy concerns or to comply with international obligations. During times when data collection or distribution is restricted, the remote sensing operator must also guarantee government access to the data using US government-approved encryption devices capable of denying access to unauthorized users.[257] Defended as necessary (to deny the general public access to high-resolution imagery of military significance), at the same time shutter control is criticized

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[254] Kristin Lewotsky, "Remote Sensing Grows Up: A Maturing Application Base and Gradual Commercialization Mark the Future of the Remote-Sensing Market" (April 2001), online: Society for Optical Engineering <http://www.oemagazine.com/fromTheMagazine/archives.html> (reporting that this restriction doesn't really affect operation of the system due to technological limits on how quickly data can be received from the satellite and formatted).
[255] *Ibid.*
[256] Preston and Baker, *supra* note 18 at 147.

as being counterproductive and even illegal. The US Chamber of Commerce points out that the policy encourages reliance on foreign systems which do not practice shutter control.[258] In the long term the US policy has the potential to harm national security by hurting the domestic remote sensing industry and increasing military reliance on foreign remote sensing systems. It has been pointed out that shutter control might not survive a First Amendment challenge.[259] Also, since high-resolution imagery is increasingly available from foreign competitors, shutter control may simply not work. Recognizing the controversy behind shutter control policy, the US government departments involved in remote sensing licensing issued a Memorandum of Understanding in February 2000 stating that shutter control "should be imposed for the smallest area and for the shortest period of time necessary" and that alternatives to shutter control should be considered, such as delaying data release.[260] From 7 November 2001 until 5 January 2002, rather than use its shutter control option, the US government bought exclusive rights to imagery of Afghanistan from Space Imaging Company's IKONOS system. Dubbed "checkbook shutter control" by the press, this alternative was also criticized for denying data to the media and humanitarian organizations.[261] Another controversial limitation on US commercial remote sensing systems has been the limitation on collection or release of remote sensing data covering Israel having a resolution less than that routinely available

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[257] Presidential Decision Directive (PDD)-23, *Fact Sheet: Foreign Access To Remote Sensing Space Capabilities* (10 March 1994), online: FAS <http://www.fas.org/irp/offdocs/pdd23-2.htm>; Hoversten, *supra* note 252 at 269-270.

[258] US Chamber of Commerce, "National Space Policy Review: Remote Sensing", online: US Chamber of Commerce <http://www.uschamber.org/space/policy/remotesensing2.htm>.

[259] Gabrynowicz, "Expanding Remote Sensing," *supra* note 251 at 120.

[260] US White House, Office of Science and Technology Policy and National Security Council, "Fact Sheet Regarding the Memorandum of Understanding Concerning the Licensing of Private Remote Sensing Satellite Systems" (2 February 2000), online: NOAA <http://www.licensing.noaa.gov/moufactsheet.htm>. The memo is between the Departments of State, Commerce, Defense, Interior and the Intelligence Community.

from commercial sources, which has been interpreted to limit resolutions of less than 2 meters.[262]

In the past licensing restrictions were imposed only for certain times or places when necessary. However, more recently restrictions have been imposed through a so-called two-tiered licensing structure, with specific systems being approved to only operate at prescribed levels. If that level is to be exceeded or if certain states request data, the remote sensing operator must get additional approval.[263]

> *In issuing licenses for new and advanced technologies that have not previously been licensed by NOAA, NOAA may apply new license conditions to address the unique characteristics and attributes of these systems. For example, NOAA may grant a "two-tiered" license, allowing the licensee to operate its system at one level, available to all users, while reserving the full operational capability of that system for [US Government] USG or USG-approved customers only. In some cases, the system may have a USG partnership client.*[264]

Doubts have been raised about the legality of such a two-tiered licensing scheme, in terms of whether such an additional approval requirement seems unauthorized and/or discriminatory.[265] Limitations imposed on specific systems as a result of the two-tiered licensing process further complicate the domestic regulatory scheme.

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[261] *Ibid.*; See also Smith, *US Space Programs, supra* note 20 at 5.

[262] The Kyl-Bingaman Amendment to the *National Defense Authorization Act for Fiscal Year 1997,* Pub. L. No. 104-201 §1064 ("[a] department or agency of the United States may issue a license for the collection or dissemination by a non-Federal entity of satellite imagery with respect to Israel only if such imagery is no more detailed or precise than satellite imagery of Israel that is available from commercial sources"). The Department of Commerce makes an annual determination of the resolution limit. See 65 Federal Register 46822.

[263] Gabrynowicz, *supra* note 251 at 119.

[264] 65 Federal Register 46822, *supra* note 262.

[265] *Ibid.* (citing, among others, restrictions placed on RADARSAT 2 data distribution restrictions for 0.5-meter or less resolution).

Some experts predict that bilateral and multilateral agreements may be adopted in the future to mutually "blind" remote sensing systems upon request or establish dissemination criteria for collective benefit.[266] In the words of one observer,

> *Bilateral and multilateral agreements are very important in formulating customary law at the international level. The [Commercial Remote Sensing] legal regime is evolving on a satellite-by-satellite basis and will have an impact on the international space law environment because of the hybrid nature of the regime.*[267]

The recently concluded agreement governing the international meteorological system[268] is an example of such a multilateral arrangement. Notably, this agreement addresses national US security concerns by guaranteeing data access and the ability for "selective denial of critical data" to adversaries in time of war.[269]

Legal regimes vary widely internationally, as countries adopt unique regulations to deal with their perceived national security and foreign policy objectives.[270] For example, systems in Europe are different from that adopted by the US. In France, remote sensing is governed by a contractual and administrative system, whereas Russia relies on broad federal legislation and, like the US, has experienced conflicts between intelligence-gathering and commercial use of data. In India, distribution of data is strictly controlled and militarily sensitive information is removed from commercial images.[271] Canada's remote sensing legislation is very similar to US

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[266] Hays, *supra* note 216 at 38.
[267] Joanne I. Gabrynowicz, "Foreign Commercial Remote Sensing Laws and Regulations: Current Legal Regimes: A Brief Survey of Remote Sensing Law Around the World" (Presentation made to the Advisory Committee on Commercial Remote Sensing, 14 January 2003).
[268] See above, section I(B)(3).
[269] Gabrynowicz, "Expanding Remote Sensing," *supra* note 251 at 112, citing the *Agreement Between the United States National Oceanic and Atmospheric Administration and the European Organization for the Exploitation of Meteorological Satellites in an Initial Joint Polar-Orbiting Operational Satellite System* (19 November 1998), online: NOAA <http://discovery.osd.noaa.gov/IJPS/documents.htm>.
[270] *Ibid.*
[271] *Ibid.*

law.[272] In sum, as States continue to rely on domestic and foreign remote sensing sources for military and national security purposes, they will need to be aware of other national remote sensing regimes.

4. Navigational Aids

Due to heavy reliance on satellite-based navigation systems (especially the US GPS) by military and civilian users, such systems are specifically designed to address national security concerns. The American GPS, for example, was designed with two technical capabilities to protect signal integrity for authorized users (including the military): selective availability (SA) and anti-spoofing (AS). In addition, the system is controlled by the US military and consists of hardened satellite vehicles and ground stations that are physically protected from attack.

GPS provides two levels of service: a Standard Positioning Service (SPS) and a Precise Positioning Service (PPS) for authorized users, primarily the DOD. Selective availability (SA), as discussed previously, is the ability of the DOD to degrade the SPS signal for civilian users; however, SA was turned off 1 May 2000 by Presidential decision.[273] The US Government, recognizing GPS' "key role around the world as part of the global information infrastructure," recently reaffirmed its commitment to provide the best possible service to civil and commercial users worldwide both in times of conflict and in peace.[274] Anti-spoofing (AS), another way military use of GPS is protected, consists of encryption of the precision code so that users must have a

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[272] Hays, *supra* note 216.

[273] See White House, Press Release, *supra* note 89. SA is the potential to degrade the accuracy of the SPS signal by "dithering" (inducing errors in) the satellite clocks and adding "ephemeris" (position) errors.

cryptographic "key" to receive it, thus denying its use to unauthorized users. AS, therefore, protects military access to the PPS but does not affect the SPS signal at all.[275] Galileo, the planned European satellite navigation system, will protect States' national security interests by providing different levels of service to users with differing levels of reliability at varying costs.[276]

Despite efforts to protect navigation signals, however, they are still low-power signals susceptible to intentional jamming. An August 2001 DOT report warned that the US transportation sector should not rely on GPS exclusively for navigation, since loss of the signal could have severe consequences for safety and the US economy.[277] The planned new generations of GPS satellites will have the ability to manage signal power levels for users in specified areas to increase jamming resistance.[278] National security interests in the reliability of satellite-based navigation systems are therefore addressed through a combination of technical and policy measures.

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[274] US Coast Guard, "US Policy Statement Regarding GPS Availability" (21 March 2003), online: US Coast Guard Navigation Center <http://www.navcen.uscg.gov/gps/default.htm>.

[275] See online: Navstar GPS Joint Program Office <https://gps.losangeles.af.mil/gpsarchives/1000-public/1300-lib/html/faq.html>.

[276] Galileo, with launches planned for 2006 and operational capability in 2008, will have: 1) a free Open Service (OS) comparable to the GPS SPS, 2) a Safety of Life Service (SoL) with improved service and timely warnings of guaranteed accuracy failures, 3) a Commercial Service (CS) for improved accuracy and a service guarantee, 4) a Search and Rescue Service (SAR) which will broadcast distress messages, and 5) a Public Regulated Service (PRS) with controlled access and encrypted data reserved principally for public authorities responsible for civil protection, national security and law enforcement. See online: EU <http://europa.eu.int/comm/dgs/energy_transport/galileo/programme/needs_en.htm>.

[277] US DOT John A. Volpe National Transportation Systems Center, *Vulnerability Assessment of the Transportation Infrastructure Relying on the Global Positioning System: Final Report* (29 August 2001), online: US Coast Guard Navigation Center <http://www.navcen.uscg.gov/gps/geninfo/pressrelease.htm>.

[278] Preston and Baker, *supra* note 18 at 156.

V. Legal Restrictions on Military Use of Space Assets

The previous chapters of the thesis have surveyed the numerous uses of space assets to further national security interests of States. Particularly considering the fact that civilians and armed forces are frequently relying on the same space systems, it is important to consider limitations on the use of these assets by States. Potential sources of such limitations may include international law, policy, contractual obligations, liability concerns, and government-imposed rules of engagement.

A. Contractual and Policy Restrictions

Since States must purchase or lease various civilian space services, such as remote sensing and communications, the contracts through which these transactions occur may be the source of limitations on military use. For example, remote sensing purchases might be made on an exclusive basis, prohibiting further dissemination of the information, or might prohibit use of the information for specified purposes. A lease of communications transponders could similarly contain restrictions on their use. A possible future scenario might see a foreign-owned remote sensing company or satellite communications company refusing access to and use by US military forces based either on opposition to US policy in a particular engagement or a desire to remain neutral.[279]

Although not contractually based, there were similar attempts to restrict use of the Intelsat and Inmarsat communications satellites prior to the privatization of the two organizations. (Intelsat went even further, *encouraging* use of its satellites in some

[279] Daniel Gonzales, "The Changing Role of the US Military in Space," (Study of the Rand Corporation, 1999), online: RAND <http://www.rand.org/publications/MR/MR895> at 21.

situations by promising free satellite capacity to UN peacekeeping forces.[280]) The Inmarsat Convention of September 1976 provided in Article 3 that "[t]he Organization shall act exclusively for peaceful purposes."[281] Some experts have opined that this imposed no greater a limitation than that provided under international law for any satellite service provider.[282] The interpretation of the ubiquitous term "peaceful" under international space law, however, has been extremely controversial and will be discussed in a later section. Some commentators believed the use of Inmarsat for US naval communications in support of the first Gulf War violated this clause, while others believed the uses were acceptable under the definition.[283] In any event, the uses occurred and were tolerated.

Article III of the Intelsat Definitive Agreement specifically attempted to restrict certain military uses of the system:

> *(d) The INTELSAT space segment may also, on request, and under appropriate terms and conditions, be utilized for the purposes of specialized telecommunications services, either international or domestic, other than for military purposes [. . .]*
> *(e) INTELSAT may, on request and under appropriate conditions, provide satellites or associated facilities separate from the INTELSAT space segment for:*
> *[. . .] (iii) specialized telecommunications services, other than for military purposes;*[284]

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[280] Richard A. Morgan, "Military Use of Commercial Communications Satellites: A New Look at the Outer Space Treaty and "Peaceful Purposes" (September-October 1994) 60 J. Air L. & Com. 237 at 269 [Morgan].
[281] *Final Act of International Conference on the Establishment of an International Maritime Satellite System* (London, 1976), reproduced in part in Nicholas Mateesco Matte, *Aerospace Law: Telecommunications Satellites* (Toronto: Butterworths, 1982) at 285 [Inmarsat Convention].
[282] Morgan, *supra* note 280 at 282. A discussion of international law and "peaceful purposes" follows below, section V(C)(2)(b).
[283] *Ibid.* at 287. The Inmarsat lead counsel opined that: "'Peaceful' suggests 'something which does not relate to armed conflict.'" The General Counsel for the US signatory to the Convention, COMSAT, took a broader view that "neither installation of INMARSAT terminals on military vehicles nor their use in peacetime is restricted. They conclude that permissible uses during actual hostilities include use in support of actions pursuant to U.N. resolutions and use in support of other humanitarian purposes." *Ibid.*
[284] *Ibid.* at 294.

Thus, Intelsat explicitly prohibited the use of certain "specialized telecommunications services" for military purposes. It should be noted that since privatization of these organizations, both Intelsat and Inmarsat advertise the military as a valuable customer,[285] perhaps an indication that future restrictions are more likely to be profit-driven rather than policy-related. Another such indication may be the absence of restrictions on use of French SPOT Image data by the US-led coalition during the recent hostilities in Iraq, despite strong French opposition to the war.

Restriction on military uses of satellites may be policy-related. Thus, the US Government decision in 2000 not to degrade the civilian GPS navigation signal through use of the selective availability capability, instead relying on local denial and anti-jamming efforts, is a prime example of such a policy restriction. As a practical matter, military uses of space systems may also be restricted by domestic allocations of the radio frequency spectrum. The ITU has no jurisdiction over the use of the spectrum for military purposes;[286] however, demands for equitable access to certain frequencies and orbits by developing States may decrease available spectrum ranges at the national level for governmental use.[287] In the US, for example, recent spectrum "battles" have occurred

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[285] See the Intelsat website, online: Intelsat <http://www.intelsat.com/company/investors/companyprofile.asp> ("We also distinguish ourselves by the diverse range of applications for which our services are used, such as voice and data, corporate network, video, government/military and Internet applications, each of which contributes importantly to our revenue") and the Inmarsat website, online: Inmarsat <http://www.inmarsat.com/maritimesafety/inmc.htm> ("Inmarsat-C is used in the land-mobile (road transport, railways), maritime (yachts, fishing boats, commercial shipping) and aeronautical (business and military aircraft, helicopters) arenas; by newsgatherers, international business travellers and aid workers; and for remote monitoring and data collection").

[286] *Constitution and Convention of the International Telecommunications Union*, 22 December 1992, (Geneva: ITU, 1992), Art. 48(1) ("Members retain their entire freedom with regard to military radio installations."). Although the ITU regulations do not, therefore, apply to the military, armed forces must avoid harmful interference with other users as a practical matter. Further, Article 48(2) requires military radio installations to observe, *to the extent possible*, measures designed to avoid harmful interference.

[287] Stephen Gorove, *Developments in Space Law: Issues and Policies* (Dordrecht, The Netherlands: Martinus Nijhoff, 1991) at 56 (noting that the term "equitable access" appears in several ITU instruments

between the Federal Communications Commission (FCC), which assigns and manages the radio spectrum for private users and state- and local- governments, and the Department of Commerce's National Telecommunication and Information Administration (NTIA), which assigns and manages the radio spectrum for the federal government. Forty percent of the federal government spectrum is assigned to the military exclusively, and the DOD has continuously resisted civilian incursions into its designated spectrum, citing the importance of assured access to its operations, including those in space.[288] As the ITU's Secretary-General noted, "Telecommunications provide the only link between space and the earth, and whatever happens in space or whatever use is made of space, telecommunications are required to make it possible."[289] Recognizing the necessity for efficient spectrum management that protects governmental interests, on 5 June 2003 the White House announced a Spectrum Policy Initiative "to develop recommendations for improving spectrum management policies and procedures for the Federal Government and to address State, local, and private spectrum use."[290] Such reallocation will certainly affect the military, through its examination of both military-designated frequencies and government use of the commercial spectrum through leasing.

Another aspect of space use (and abuse) of growing importance to all users is space debris. Space debris can be simply described as space litter. Often manmade, debris can consist of dead satellites, satellite components, paint chips, or abandoned rocket

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and reflects the attempts of developing States guarantee themselves equal rights to desirable orbits and frequencies).

[288] *Ibid*; Michael Green, "EyeforWireless 802.11 *Spectrum and Regulatory Update*" (30 May 2002), online: Atheros Communications <http://www.musenki.com/~jim/EyeForWireless/michael%20green2.ppt>.

[289] R.E. Butler, "Satellite Communications: Regulatory Framework and Applications for Development" (1985) 3 *Space Communications and Broadcasting* 103, quoted in I.H.Ph. Diederiks-Verschoor, *An Introduction to Space Law*, 2nd ed., (The Hague: Kluwer Law, 1999) at 57.

engines.[291] Since the debris stays in orbit travelling at high speeds, there is the possibility that it will collide with active satellites, causing serious damage.[292] While there are currently no binding international agreements specifically addressing the issue of space debris,[293] this is another area that has the potential to affect military operations. Recognizing this, the US was the first State to begin to address the problem at the national level. Beginning in 1984 with the Commercial Space Launch Act and continuing through the present with NASA and DOD efforts to reduce debris and move inoperative satellites out of high-demand orbits, the US has made debris reduction an important objective of its space policy.[294] Other States have since adopted debris-reduction regulations, and several space-faring nations have formed an Inter-Agency Space Debris Coordination Committee (IADC) to exchange information on space debris research and identify debris mitigation options.[295] The UN has also performed numerous studies through COPUOS,[296] and the UN General Assembly Resolution 57/116 of

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[290] US White House, Press Release, "Presidential Memo on Spectrum Policy" (5 June 2003), online: White House <http://www.whitehouse.gov/news/releases/2003/06/20030605-5.html>.

[291] The ESA reports that "Only 6% of the catalogued orbit population are operational spacecraft, while 50% can be attributed to decommissioned satellites, spent upper stages, and mission related objects (launch adapters, lens covers, etc.). The remainder of 44% is originating from 129 on-orbit fragmentations which have been recorded since 1961 [. . .] Only near sizes of 0.1 mm the sporadic flux from meteoroids prevails over man-made debris." Online: ESA <http://www.esoc.esa.de/external/mso/debris.html>.

[292] Andrew C. Revkin, "Wanted: Traffic Cops for Space: As Debris and Satellites Multiply, UN Steps In" *The New York Times* (18 February 2003) D1.

[293] But see Gorove, *supra* note 287 at 166-167 for the proposition that, although the term "space debris" is not specifically mentioned in any space treaty, it may be covered under existing treaty provisions. For example, he believes all provisions relating to "space objects" would apply to space debris if space debris is properly considered a "space object" (a recurring subject of legal debate), including those mandating State responsibility and liability for damage done by "space objects" under the Liability Convention and Outer Space Treaty. In addition, he argues that space debris would violate treaty provisions protecting freedom of exploration and use of outer space (Article I of the Outer Space Treaty) and those requiring States to avoid harmful contamination of outer space (*e.g.*, Article IX of the Outer Space Treaty).

[294] See *e.g.*, NASA Policy Directive 8710, "Policy to Limit Orbital Debris Generation"; US Space Command (USSPACECOM) Regulation 57-2, "Minimization and Mitigation of Space Debris" (6 June 1991).

[295] Online: IADC < http://www.iadc-online.org/ >. The members represent Italy, the United Kingdom, France, China, Germany, the ESA, India, Japan, the US, and the Ukraine.

[296] See *e.g.*, *National Research in Space Debris, Safety of Space Objects with Nuclear Power Sources on Board and Problems Related to Their Collision with Space Debris*, UN COPUOUS,

11 December 2002 recommended to Member States to devote more attention to debris-related issues.[297]

B. Liability

Fears over governmental liability for services provided to civilians may also limit military control and use of its space systems, such as GPS. Because of heavy civilian reliance on GPS satellite navigation signals, the US has created a governmental interagency board to manage the system and address civilian user concerns, while discontinuing selective availability (SA). Currently international pressure is being applied on the US to allow establishment of an international legal framework to address liability, reliability and availability of the GPS signals, and international control of the system prior to its acceptance as an important element of the Global Navigation Satellite System (GNSS).[298] The International Civil Aviation Organization (ICAO)[299] envisions GNSS to be an essential component in an advanced air navigation system that will allow pilots *en route* to accurately determine their positions and allow air traffic controllers to more safely and efficiently manage airspace.[300]

UN Doc. A/AC.105/789 (4 December 2002), online: UN Office for Outer Space Affairs (OOSA) <http://www.oosa.unvienna.org/Reports/AC105_789E.pdf>.

[297] *International Cooperation in the Peaceful Uses of Outer Space*, UN GAOR, UNGA Res. 57/116 (11 December 2002),online: UN OOSA <http://www.oosa.unvienna.org/spacelaw/gares/index.html>.

[298] Jiefang Huang, "Development of the Long-term Legal Framework for the Global Navigation Satellite System" (1997) 22:1 Ann. Air & Sp. L. 585 at 586 [Huang]. The Russian Global Navigation Satellite System (GLONASS) and the planned European Galileo satellite navigation system are the other GNSS components.

[299] ICAO is a body of the UN with the responsibility to set common principles and standards for safe, efficient, economical global civil aviation. See ICAO website, online: ICAO <http://www.icao.org>.

[300] Huang, *supra* note 298. In 1981, the *Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space* endorsed the idea that:

> *ICAO is responsible for developing the position of international civil aviation on all matters related to the study of the questions involving the use of space technology for air navigation purposes, including the determination of international civil aviation's particular requests in respect of space technology.*

Addressing the concerns of many States, ICAO adopted a resolution recognizing "the urgent need for the elaboration [. . .] of the basic legal principles" and "the need for an appropriate long-term legal framework" to govern GNSS, "especially those [principles] concerning institutional issues and questions of liability."[301] The resolution also recognized the predominant view that an international convention may be needed to address these concerns, and ICAO's Legal Committee is in the process of drafting such a convention.[302]

In general many States are concerned that US and Russian military control of GPS and GLONASS may not ensure global reliability. They are also concerned that current liability rules may not adequately protect victims of aviation accidents based on faulty or unavailable satellite navigation signals, arguing that liability is not assured under either international law or domestic law.[303] Article VII of the Outer Space Treaty states that launching States are internationally liable to other contracting States for damage caused by its space object on the Earth, in air space or in outer space.[304] Article VI of the Outer Space Treaty places upon States international responsibility for their activities in space (and those of their private entities) and requires continuing State supervision. Experts[305]

Report on the Civil Aviation Interests in the Use of Outer Space (Background paper presented for the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, ICAO Doc. A/CONF.101/BP.IGO/1 (1981), quoted in R.I.R. Abeyratne, *Legal and Regulatory Issues in International Aviation* (New York: Transnational Publishers, 1996).

[301] *Development and Elaboration of an Appropriate Long-Term Legal Framework to Govern the Implementation of GNSS*, ICAO Assembly Resolution, ICAO Doc. A32-20 (1998).

[302] See ICAO website, online: ICAO <http://www.icao.org>; Paul B. Larsen, "GNSS International Aviation Issues" (1998) IISL3.02 at 187 [Larsen, GNSS].

[303] Huang, *supra* note 298 at 594.

[304] Outer Space Treaty, *supra* note 105.

[305] *E.g.*, Stephen Gorove, "Some Comments on the Convention on International Liability for Damage Caused by Space Objects" (Proceedings of the Sixteenth Colloquium on the Law of Outer Space, 1973) (indirect damages were intentionally omitted from the recovery scheme and are therefore not covered); see also Huang, *supra* note 298. For the opposing view, that such a claim would be valid under the Convention, see *e.g.*, Paul B. Larsen, "Legal Liability for Global Navigation Satellite Systems"

disagree whether the Liability Convention would apply to aviation accidents resulting from a faulty satellite navigation signal.[306] Those who believe the Liability Convention would *not* apply take the view that only physical collisions with a space object are covered. In addition, they point out that economic damage and consequential loss would not be covered by the Convention in any event.[307]

The Legal Committee is also considering no-fault or limited liability schemes,[308] since experts warn that resort to domestic law of the signal provider would give unpredictable results. For example, one expert opines that the Good Samaritan principle, as applied to US provision of a free navigation signal, would impose a duty of care on the US government for voluntarily providing the signal.[309] Others point out that under the US Federal Tort Claims Act (FTCA), sovereign immunity may be waived when negligence of a government employee acting within the scope of his duties causes monetary damage, but they express concern that the FTCA does not apply to discretionary conduct by the employee and does not apply to claims for monetary damage arising in a foreign

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(Proceedings of the Thirty-Sixth Colloquium on the Law of Outer Space, 1993)(agreeing with Bin Cheng that a claimant who could show causation would state a valid claim under the Convention). In any event, the US would almost certainly refuse to recognize the validity of a claim filed under the Liability Convention for damages resulting from incorrect GPS data. Jonathan M. Epstein, "Comment: Global Positioning System (GPS): Defining the Legal Issues of its Expanding Civil Use" (September/October 1995) 61 J. Air L. & Com. 243 at 269 [Epstein].

[306] *Convention on International Liability for Damage Caused by Space Objects*, 29 March 1972, 961 UNTS 187 [Liability Convention]. One observer notes:

> *While essentially establishing strict liability for the launching state, neither the convention language, deliberations on the treaty, or commentators indicate that this convention was meant to cover anything other than direct physical damage at the earth's surface caused by a malfunctioning launch vehicle or a space vehicle/satellite that did not burn up on reentry.*

Epstein, *ibid.*

[307] Huang, *supra* note 298 at 595.

[308] *Ibid.*

[309] B.D.K. Henaku, *The Law on Global Air Navigation by Satellite: A Legal Analysis of the ICAO CNS/ATM System* (Leiden, AST Law: 1998).

country.[310] Significantly, the US believes that current law governing air navigation systems and air traffic control adequately addresses any liability concerns.[311] Although an international treaty governing GNSS issues would not be effective without the support of the signal providers, it is possible that US economic interests in making its GPS the key component of GNSS would lead to US compromise on these issues.

As civilians rely increasingly on military satellite systems and launch facilities, liability concerns will become even more important to States. As an example, for civilian launches the US government addresses liability concerns during the licensing process, requiring launch operators to prove financial ability to compensate the Government for any liability finding (whether based on national or international law), most often through insurance.[312] Future liability issues may be addressed through contracts, bilateral or multilateral agreements, or treaties and may limit the States' willingness to allow civilian reliance on governmental systems.

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[310] Larsen, GNSS, *supra* note 302 at 185; Kim Murray, *The Law Relating to Satellite Navigation and Air Traffic Management Systems – A View from the South Pacific* (2000) 31 VUWLR 383 [Murray]. Thus, under the FTCA it would appear that the initial decision to supply a GPS signal to civilian users and any decision to provide only a specified level of service (i.e., a degraded signal) might be considered discretionary and therefore not covered under the FTCA. Likewise, claims arising in a foreign country would not be covered. However, the interpretation of the term "arises" may be broad enough to cover a foreign accident caused by a negligent act in the US in providing the signal. Bill Elder, "Comment: Free Flight: The Future of Air Transportation Entering the Twenty-First Century" (February/March 1997) 62 J. Air L. & Com. 871 at 901.

[311] Assad Kotaite, "ICAO's Role with Respect to the Institutional Arrangements and Legal Framework of Global Navigation Satellite Systems (GNSS) Planning and Implementation" (1996) 21 Ann. Air & Sp. L. 195 at 203, quoted in Murray, *supra* note 310 at 397.

[312] I.H.Ph. Diederiks-Verschoor, *An Introduction to Space Law*, 2nd ed., (The Hague: Kluwer Law, 1999) at 117.

C. Rules of Engagement as the Implementation of Law and Policy

Rules of engagement (ROE) "provide guidance governing the use of force" by US armed forces.[313] A pre-defined set of ROE, called the Standing ROE (SROE), applies to military attacks against the US and to all "military operations, contingencies, and terrorist attacks occurring outside the territorial jurisdiction of the US." Peacetime operations within the US are not governed by the SROE, but are covered by rules on the use of force.[314] The purposes of the SROE are threefold:

(1) provide guidance for the use of force to accomplish a mission,

(2) implement the inherent right of self-defense, and

(3) provide rules to apply in peace, armed conflict, and transition periods between peace and conflict.

The SROE are issued by the Chairman of the Joint Chiefs of Staff (CJCS) and are approved by the National Command Authorities (NCA), who are "the President and the Secretary of Defense or their duly deputized alternates or successors."[315] Combatant commanders of specific theaters of operations may augment the SROE based on changing political and military policies, threats, and missions in their assigned areas.[316] These theater-specific ROE must be approved by the NCA through the CJCS. Commanders at every level of command establish ROE to accomplish their assigned

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[313] Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3121.01A, *Standing Rules of Engagement (SROE) for US Forces* (15 January 2000) [SROE].
[314] *Ibid*, para. 3.a; DOD Directive 5210.56, *Use of Deadly Force and the Carrying of Firearms by DOD Personnel Engaged in Law Enforcement and Security Duties* (25 Feb 1992)[Rules for the use of force].
[315] Joint Pub 3-0 page II-5; *Department of Defense Dictionary of Military and Associated Terms* (23 March 1994) at 253.
[316] SROE, *supra* note 313, para 6.a. The term "CINC" (commander in chief) is used in the SROE to describe commanders of combatant commands, however more recent guidance (October 2002) restricts use of the term CINC to the President only. "Rumsfeld Declares 'CINC' is Sunk: Reminds Military only Bush is 'Commander in Chief'" *US Gov Info/Resources* (29 October 2002), online: US Gov Info/Resources <http://usgovinfo.about.com/library/weekly/aacincsunk.htm>.

missions. These supplemental ROE must comply with both ROE of senior commanders and the SROE. Importantly, these supplemental ROE may only issue guidance for using force for mission accomplishment – they may *never* limit a commander's right and obligation to use force in self-defense. Accordingly, supplemental ROE either authorize a certain action or place limits on the use of force. Notably, some types of actions and the use of certain weapons require combatant commander or even NCA authorization.[317]

The SROE, ROE, and the rules for the use of force are *not* law – they are military directives. However, the ROE are "the principal mechanism of ensuring that US military forces are at all times in full compliance with [US] obligations under domestic as well as international law."[318] Examination of the US SROE is instructive, since they are based on what one expert calls the "three pillars – national policy, operational requirements, and law."[319] The ROE are evidence, therefore, of US interpretation and implementation of law and policy. It is noteworthy that the office responsible for the ROE is the operations division (representing the warfighter), with the advice of the military lawyer.

In response to an increasing number of multinational coalitions and joint operations, the basic SROE are now unclassified to ease coordination with US allies for the development of multinational ROE consistent with the SROE.[320] Classified attachments to the SROE (called "Enclosures") contain details about and guidance for using force in specific types of operations (including Space Operations and Information Operations), but will not be addressed in this thesis beyond the unclassified level. The discussion that

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[317] SROE, *ibid*, para. 6.c.
[318] Richard J. Grunawalt, "The JCS Standing Rules of Engagement: A Judge Advocate's Primer" (1997) 42 A.F. L. Rev. 245 at 246 [Grunawalt]. See also W. A. Stafford, "How to Keep Military Personnel from Going to Jail for Doing the Right Thing: Jurisdiction, ROE, and the Rules of Deadly Force" (November 2000) 2000 Army Law 1 [Stafford].
[319] Grunawalt, *ibid* at 247.
[320] SROE, *supra* note 313, para 7.

follows will examine international law principles as applied to US and allied forces through the SROE.

1. Self-defense

In addition to issuing guidance for using force to accomplish a mission, the SROE contain detailed provisions on self-defense. The basis for the self-defense guidelines in the SROE is the Charter of the United Nations and customary international law.[321] Article 51 of the UN Charter states in part: "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 [. . .] [emphasis added]." Most States interpret this article to be much more limited in its coverage than the right granted States under customary international law – the right of preemptive self-defense. The US, however, has long maintained that so-called "anticipatory" self-defense is authorized under both customary international law and the UN Charter.[322] This view is highly controversial and not accepted by many UN Member States.[323] The US position as embodied in the SROE is based largely on a liberal reading of the famous dispute between the US and the United

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[321] Grunawalt, *ibid* at 251; *Charter of the United Nations*, 26 June 1945, 59 Stat. 1031, 145 U.K.T.S. 805, 24 U.S.T. 2225, T.I.A.S. No. 7739 [*UN Charter*].

[322] National Security Strategy of the United States of America, September 2002, online: White House <http://www.whitehouse.gov/nsc/nss.html> at 15.

> *The United States has long maintained the option of preemptive actions to counter a sufficient threat to our national security. The greater the threat, the greater is the risk of inaction—and the more compelling the case for taking anticipatory action to defend ourselves, even if uncertainty remains as to the time and place of the enemy's attack. To forestall or prevent such hostile acts by our adversaries, the United States will, if necessary, act preemptively.*
>
> *The United States will not use force in all cases to preempt emerging threats, nor should nations use preemption as a pretext for aggression. Yet in an age where the enemies of civilization openly and actively seek the world's most destructive technologies, the United States cannot remain idle while dangers gather.*

[323] Stafford, *supra* note 318 at 5.

Kingdom in the *Caroline* case.[324] In this incident, probably the first recognition internationally of the concept of anticipatory self-defense, the parties agreed that such action, to be lawful, must not only rise from necessity, but it must also be proportional to anticipated harm.[325] Likewise, the SROE require necessity and proportionality for the application of force in self-defense.[326] According to the SROE, necessity "exists when a hostile act occurs *or when a force or terrorist(s) exhibits hostile intent.*" [emphasis added][327] "Hostile intent" is further defined in the SROE as

> The *threat of imminent use of force against* the United States, US forces, and in certain circumstances, *US nationals, their property, US commercial assets*, and/or other designated non-US forces, foreign nationals and their property. *Also, the threat of force to preclude or impede the mission and/or duties of US forces*, including the recovery of US personnel or vital US property. [emphasis added]

While there is some historical and scholarly justification for anticipatory self-defense,[328] the US position as reflected in the SROE is certainly more expansive than the interpretation of that term is given by many States.

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[324] (1837) 2 Moore 409. In 1837 British subjects destroyed an American ship, the *Caroline*, in a US port, since the *Caroline* had been used for American raids into Canadian territory. The British justified the attack as self-defense. The dispute was resolved in favor of the Americans through the exchange of diplomatic notes. Daniel Webster, the US Secretary of State, proposed this definition of self-defense which the British accepted:

> *There must be a necessity of self-defense, instant, overwhelming, leaving no choice of means, and no moment for deliberation. [The force justified in the application of self-defense must consist of] nothing unreasonable or excessive; since the act, justified by the necessity of self-defense, must be limited by that necessity, and kept clearly within it.*

See Myres S. McDougal and Florentino P. Feliciano, *Law and Minimum Public World Order: The Legal Regulation of International Coercion* (New Haven and London: Yale University Press, 1961) at 217 [McDougal and Feliciano].

[325] McDougal and Feliciano, *ibid.*
[326] SROE, *supra* note 313, Enclosure A at A-4.
[327] *Ibid.*
[328] McDougal and Feliciano, *supra* note 325 at 210, 231-241 (noting, *e.g.*, that the preparatory record of the Charter indicates Article 51 was not drafted to intentionally narrow customary law requirements for self-defense by raising the required degree of necessity, but rather was drafted to accommodate regional security organizations within the Charter's scheme of collective security).

Under customary law, lawful anticipatory defense was limited by the requirement that the expected attack exhibit such a high degree of imminence that effective resort to non-violent response was precluded.[329] Many scholars argue that Article 51 of the UN Charter demands an even higher standard of necessity, since it recognizes the right to self-defense "if an armed attack" (as distinguished from an *expected* attack of any degree of imminence) occurs.[330] Other experts opine that anticipatory self-defense is not precluded by Article 51 of the UN Charter, arguing that: the drafting history of Article 51 does not indicate an intent to narrow the customary law definition; the language of Article 51 does not say "if *and only if* an armed attack occurs"[331] and therefore does not narrow customary law's recognized inherent right to self-defense; also, newer weapons systems and contemporary nonmilitary coercion techniques must be considered in the definition of "armed attack."[332]

In any event, the broad view on anticipatory self-defense is clearly reflected in the unclassified SROE. On its face the language of the unclassified SROE would appear to cover, in certain circumstances, anticipatory self-defense against threatened attacks on US telecommunications or remote sensing satellites. Accordingly, such defensive measures could be justified either as threats to US commercial assets or, in light of the military's reliance on such commercial systems, as threats that would impede the mission of US forces.

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[329] *Ibid.* at 231.
[330] *Ibid.* at 233.
[331] Thus Judge Schwebel dissenting in *Military and Paramilitary Activities in and against Nicaragua* [1986] I.C.J. Rep. 14 (27 June) at 259 [*Nicaragua v. US*]. In this case, the Court decided against the US claim that its use of force against Nicaragua was a lawful act of collective self-defense of El Salvador. The US had argued that Nicaraguan support (in the form of weapons and supplies) to rebels in El Salvador was an armed attack justifying self-defense. See also, Gregory M. Travalio, "Terrorism, International Law, and the Use of Military Force (Winter 2000) 18 Wis. Int'l L. J. 145 at 158.
[332] McDougal and Feliciano, *supra* note 325 at 235, n. 261, and 238.

The requirement of proportionality in the application of self-defense has been defined as requiring the quantum of responding force to be "limited in intensity and magnitude to what is reasonably necessary promptly to secure the permissible purposes of self-defense."[333] Similarly, the SROE define proportionality as force "reasonable in intensity, duration, and magnitude to the perceived or demonstrated threat based on all facts known to the commander at the time."[334] Implementing these requirements, the SROE set out the following guidelines for self-defense:

(1) De-escalation: warning and giving the hostile force an opportunity to withdraw or cease, when time and circumstances permit;

(2) Using proportional force which may include nonlethal weapons; and

(3) Only attacking to "disable or destroy" when that is the "only prudent means" to terminate a hostile act or intent.[335]

The SROE also distinguish between national, collective, unit and individual self-defense. In defending oneself or one's unit (military force element), SROE requires that one be defending against an observed hostile act or demonstrated hostile intent. Notably, the SROE defines the role of the commander in exercising unit self-defense as a right *and an obligation*.[336] The invocation of national self-defense, which means defending US forces (and in some circumstances US nationals, property and commercial assets), will most often result from a designated authority declaring a foreign force or terrorist(s) hostile; hence, individual units need not observe a hostile act or hostile intent. Collective self-defense, which according to the SROE involves defending non-US forces and property, must be based on an observed hostile act or intent and can only be authorized

[333] *Ibid.* at 242.
[334] SROE, *supra* note 313, Enclosure A at A-5.
[335] *Ibid*, at A-6.
[336] *Ibid*, at A-3.

by the National Command Authorities (NCA, *i.e.*, the President and the Secretary of Defense or their designated alternates).[337]

2. The Use of Force for Mission Accomplishment

Although most of the unclassified portions of the SROE focus on self-defense, ROE also provide guidance for the application of force to accomplish specific missions. Accordingly, the development of rules of engagement mandates consideration of political, military, and legal limitations that affect ROE such as: international law (including the UN Charter), US domestic law and policy, host nation law and bilateral agreements with the US, ROE of coalition forces, and UN Security Council resolutions.[338] Many of these constraints have already been addressed in other sections of this thesis, so this section will focus on those limitations that have not yet been discussed.

a. The Law of Armed Conflict

Under the SROE, "US forces will comply with the Law of War during military operations involving armed conflict, no matter how the conflict may be characterized under international law."[339] The law of armed conflict (LOAC, also called the "law of war") is the branch of international law regulating armed hostilities.[340] Although a detailed discussion of LOAC is beyond the scope of the thesis, it is important to briefly outline its sources and general principles.

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[337] *Ibid* at A-4. The term NCA is defined in Joint Pub 3-0 page II-5; *Department of Defense Dictionary of Military and Associated Terms* (23 March 1994) at 253.
[338] *Ibid*,, Enclosure L at L-2.
[339] *Ibid.*, Enclosure A, para 1.g.
[340] James C. Duncan, *Employing Non-lethal Weapons* (1998) 45 Naval L. Rev. 1 at 43; JCS Pub 1-02. *Department of Defense Dictionary of Military and Associated Terms* (1994); see also McDougal and Feliciano, *supra* note 325 at 521.

LOAC is derived from two main sources: customary international law and treaty law. The treaties regulating the use of force were concluded at conferences held at The Hague, The Netherlands and Geneva, Switzerland and can be divided into two main areas: the "law of The Hague" and the "law of Geneva."[341] In general terms, the Hague treaties deal with the behavior of belligerents and the methods and means of war (for example, lawful and unlawful weapons and targets), while the Geneva agreements address the protection of personnel involved in conflicts (*e.g.*, Prisoners of War, civilians, the wounded). LOAC sets boundaries on the use of force during armed conflicts through application of several principles:

(1) **Necessity**: only that degree of force required to defeat the enemy is permitted. In addition, attacks must be limited to military objectives whose "nature, purpose, or use make an effective contribution to military action and whose total or partial destruction, capture, or neutralization at the time offers a definite military advantage";

(2) **Distinction** or Discrimination: requires distinguishing military objectives from protected civilian objects such as places of worship and schools, hospitals, and dwellings;

(3) **Proportionality**: requires that military action not cause collateral damage which is excessive in light of the expected military advantage;

(4) **Humanity**: prohibits the use of any kind or degree of force that causes unnecessary suffering; and

[341] Ingrid Detter, *The Law of War*, 2nd ed. (Cambridge: Cambridge University Press, 2000) at 158. *E.g.*, *Geneva Convention (I) for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field*, 12 August 1949, 75 U.N.T.S. 31, Article 13 [Geneva I]; *Convention (II) for the Amelioration of the Condition of the Wounded, Sick and Shipwrecked Members of Armed Forces at Sea*, 12 August 1949, 75 U.N.T.S. 85; *Convention (III) Relative to the Treatment of Prisoners of War*, 12 August 1949; 75 U.N.T.S. 135; *Convention (IV) Relative to the Protection of Civilian Persons in Time of War*, 12 August 1949, 75 U.N.T.S. 287; *Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I)*, 8 June 1977, 16 I.L.M. 1391; *Hague Convention (V) Respecting the Rights and Duties of Neutral Powers and Persons in Case of War on Land*, Oct. 18, 1907, 36 Stat. 2310, U.S.T. 540 [Hague V]. For a complete list, see Roberts, Adam & Guelff, Richard, eds., *Documents on the Laws of War*, 3rd ed. (New York: Oxford University Press, 2000) [Roberts and Guelff].

(5) **Chivalry**: requires war to be waged in accordance with widely accepted formalities, such as those defining lawful "ruses" (*e.g.*, camouflage and mock troop movements) and unlawful treachery (for example, misusing internationally accepted symbols in false surrenders).[342]

An examination of these principles highlights the difficulties in their application as military and civilian systems become more and more intertwined. As one active duty military officer recently stated,

> *Dispersing combatants and military objects into the civilian community is offensive to international law because it violates the principle that defenders have an obligation to separate military targets from civilians and their property [. . .] But as societies become technologically integrated and, more important, dependent upon technology, separating military and civilian facilities becomes immensely more complicated.*[343]

b. "Peaceful Purposes"

Recent years have seen a continuous escalation of the uses of space for military purposes. Although the space powers reiterate their commitment to the use of space for "peaceful purposes,"[344] satellites and space systems are now overtly being used in direct support of military operations. This thesis has described use of satellites for: communications between forces engaged in armed combat; intelligence-gathering for development of targets; precision-guidance systems to accurately steer weapons to their targets; and data-collection by remote sensing for battle damage assessment. These uses, coupled with a lack of formal protests regarding them, led one expert to conclude:

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[342] Roberts & Guelff, *ibid.* at 10 (noting that proportionality and discrimination are generally incorporated into the other principles); Duncan, *supra* note 340 at 50; see also see also McDougal and Feliciano, *supra* note 325 at 521.

[343] Dunlap, *supra* note 1.

[344] See *e.g.*, the US White House National Science and Technology Council, *National Space Policy* (19 September 1996), online: White House <http://www.ostp.gov/NSTC/html/pdd8.html> (stating "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. 'Peaceful purposes' allow defense and intelligence-related activities in pursuit of national security and other goals.")

> *Given the ambiguity of the term "peaceful" as used in the [Outer Space Treaty] OST, as well as the overt and covert practice of the two state actors in outer space, the conclusion is inescapable that all military uses of space other than those prohibited by treaty were – since the beginning of space exploration and still today – lawful as long as they do not violate any of the principles and rules of international law (e.g., uses that represent the threat or employment of force).*[345]

Article IV of the Outer Space Treaty provides two arms control provisions limiting military uses of space: (1) nuclear or other weapons of mass destruction will not be placed in orbit around the Earth, on the moon or any other celestial body, or in outer space, and (2) the moon and other celestial bodies will be used exclusively for peaceful purposes; establishing military bases, testing weapons of any kind, or conducting military maneuvers on the moon and other celestial bodies is forbidden.[346] However, the term "peaceful" remains undefined in the context of international space law and has been the source of continuing and frustrating debate. It has been argued that the plain meaning and "[t]he widely accepted interpretation given this key term of space law prior to and immediately after the advent of the space age, namely that 'peaceful' means 'non-military,' was soon contradicted by the practice of States, primarily the United States and the Soviet Union."[347]

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[345] Ivan 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) at 45.

[346] Outer Space Treaty, *supra* note 105, Art IV, which states:

> *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.

[347] Vlasic, *supra* note 345 at 37.

Thus, the definition of "peaceful" seems to be expanding according to State practice. For example, for over forty years the US defended the position that "peaceful" means "non-aggressive," so that any military use is lawful so long as it does not violate either Article 2(4) of the UN Charter, which prohibits "the threat or use of force," or Article IV of the Outer Space Treaty.[348] In 1991, while examining the legality of using Inmarsat communications satellites in support of armed conflict in the first Gulf War, The Judge Advocate General (TJAG) of the US Navy concluded that the use of Inmarsat to support the US-led coalition was legal since it was performed under the auspices of UN resolutions.[349] The US Department of State, in its support of the Navy opinion, stated:

> *The Convention does not define "peaceful purposes," and its negotiating history does not suggest a specific meaning. Under such circumstances, the term ... should be given the meaning that it has been accorded under the law relating to space activities. Under such a reading, "peaceful purposes" does not exclude military activities so long as those activities are consistent with the United Nations Charter.*[350]

One US official has expressed the view that "non-aggressive" is itself too restrictive a description, that "[t]here are times when 'aggression' is permissible (e.g., for the common interest, peace-keeping or enforcement or individual or collective self-defense)."[351] He further argues that there is an important distinction between peaceful "purposes" and peaceful "uses." Thus, satellites may be "used" to support armed military operations, as long as the "purpose" of the use is to restore a "climate of peace."[352] Under this interpretation even weapons in space, as long as they are not weapons of mass destruction

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[348] *Ibid.* at 40.
[349] Richard A Morgan, *Military Use of Commercial Communications Satellites: A New Look at the Outer Space Treaty and "Peaceful Purposes"* (September/October 1994) 60 J. Air L. & Com. 237 at 294.
[350] *Ibid.* at 295 (quoting the Memorandum for the Chief of Naval Operations by the Deputy Assistant Judge Advocate General (14 January 1991) and the Attachment to the Memorandum for the Chief of Naval Operations by the Deputy Assistant Judge Advocate General (14 January 1991).
[351] *Ibid.*
[352] *Ibid.*

prohibited under Article IV, if used for "peaceful purposes" would not violate the Outer Space Treaty. Arguments could be made that Article IX of the Outer Space Treaty, which allows each State Party to request consultation if it believes the space activities of another State might cause harmful interference to the peaceful use of space, could be used to challenge and constrain a particular military activity.[353] However, various unopposed military uses of space may as a practical matter enlarge the unofficial definition of "peaceful purposes" to the point that specific arms control agreement may be the only effective limitation on the military use of space, with few corresponding limits on the development and implementation of space ROE.

c. Arms Control Limitations

Military uses of outer space may also be limited by disarmament and arms control agreements. In addition to the Outer Space Treaty, already discussed, the following merit mention:[354]

(1) The 1963 Limited Test Ban Treaty prohibits "any nuclear weapon test explosion, or any other nuclear explosion" in the atmosphere, underwater, or in outer space.[355]

(2) The Biological and Toxins Convention of 1972 and the Chemical Weapons Convention of 1992 prohibit development, production, stockpiling, and acquisition of biological agents, weapons containing toxins, and chemical weapons for hostile purposes.[356]

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[353] Outer Space Treaty, *supra* note 105, Article IX.

[354] M. Lucy Stoyak, *Excerpt from a Report Prepared for the Canadian Department of Foreign Affairs and International Trade Entitled 'The Non-Weaponization of Space'* (August 2001) (copy on file with the author).

[355] *The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water*, 480 U.N.T.S. 43 (entered into force 10 October 1963).

[356] *Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction* (1976) no. 11 U.K.T.S., Cmd 6397 (entered into force 26 March 1975); *Chemical Weapons Convention 1992* (entered into force 31 October 1996).

(3) The 1980 Environmental Modification Convention prohibits all military or hostile environmental modification techniques that might cause long-lasting, severe or widespread environmental changes in Earth's atmosphere or outer space.[357]

(4) A series of bilateral agreements between the US and the former Soviet Union (now binding on Russia) prohibit interference with early warning systems and technical means of verification (reconnaissance and communications satellites) to reduce the risk of nuclear war and monitor treaty compliance.[358]

It has been noted that the series of US/Russia bilateral agreements establish a limited regime that protects certain types of satellites. It has further been suggested that "[t]hese bilateral agreements may set precedents in codifying the norm of non-interference with Earth-orbiting objects," opening the possibility of widening the scope of satellite protection beyond the bilateral level.[359] Perhaps heeding this observation, a recent US Congressionally-mandated commission to assess space issues warned, "The U.S. must be cautious of agreements intended for one purpose that, when added to a larger web of treaties or regulations, may have the unintended consequence of restricting future activities in space."[360] It is safe to conclude, therefore, that space powers will at least in the foreseeable future preserve the *status quo* of relatively permissive space law to keep their military options open.

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[357] *Convention on the Prohibition of Military or any other Hostile Use of Environmental Modification Techniques*, 31 U.S.T. 333 (entered into force 5 October 1978).
[358] *Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War* (1972) 807 U.N.T.S. 57 (entered into force 30 September 1971); *Agreement on Measures to Improve the USA-USSR Direct Communications Link* (1972) 806 U.N.T.S. 402 (entered into force 30 September 1971); *Agreement Between the United States of America and the Union of Soviet Socialist Republics on the Prevention of Nuclear War* (1973), U.S.T. 1478 (entered into force 5 October 1978); *Agreement Between the United States of America and the Government of the Union of Soviet Socialist Republics on Notifications of Launches of Intercontinental Ballistic Missiles and Sub-Marine Launched Ballistic Missiles* (entered into force 31 May 1988); *Agreement Between the United States of America and the Government of the Union of Soviet Socialist Republics on the Prevention of Dangerous Activities* (entered into force 1 January 1990); *Memorandum of Agreement Between the Government of the United States and the Government of the Russian Federation on the Establishment of a Joint Center for the Exchange of Data from Early Warning Systems and Notifications from Missile Launches*. See Stoyak, *supra* note 354.
[359] Stoyak, *supra* note 354.

d. ROE Relating to Outer Space

The SROE contain a new regulation (called an "Enclosure") specifying rules of engagement for US military space operations. Although its exact contents are classified, the unclassified description indicates the Enclosure defines indicators of hostile acts and hostile intent directed against US space forces and space assets, and defines the circumstances and authority required for actions to protect DOD and designated space assets.[361] Current SROE reflects restraint in targeting "military or civilian space systems such as communications satellites or commercial earth-imaging systems" used to support hostile action, noting that "[a]ttacking third party or civilian space assets can have significant political and economic repercussions." Accordingly, "commanders may not conduct operations against [foreign] space-based systems or ground and link segments of space systems" without specific NCA authorization.[362] These restrictions on targeting third party military and civilian space systems clearly reflect the fact of the military and civilians relying on the same systems for critical services.

D. Legal Implications of Military Reliance on Civilian Systems

As armed forces and civilian users increasingly depend on the same commercial space systems, the application of LOAC principles is becoming more complicated. Moreover, the fact that civilians now control systems vital to militaries during times of armed conflict raises certain ethical and practical issues that cannot be ignored.

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[360] US, Commission to Assess US National Security Space Management and Organization, *Report of the Commission to Assess US National Security Space Management and Organization, pursuant to P.L. 106-65* (11 January 2001), online: <http://www.space.gov/doc/fullreport.pdf> [Space Commission].
[361] SROE Information Paper (29 November 1999); SROE, *supra* note 313, Enclosure A at A-7.
[362] *Ibid.*

1. Neutrality Implications of "Dual Use" Technologies

Under LOAC principles, legitimate military targets must be distinguished from protected civilian objects. Anticipated collateral damage must be weighed against expected military advantage, and excessive civilian damage avoided. However, force may lawfully be used against objects which an adversary is using for a military purpose, if neutralization of the object would offer a definite military advantage.[363] The analysis becomes more complex, however, when the object being used by the adversary belongs to a "neutral" third party.

Nonparticipants in a conflict may declare themselves to be neutral.[364] As long as the neutral State does not assist either belligerent party, it is immune from attack by the belligerents. However, if one of the belligerents uses the territory of a neutral nation in a manner that gives it a military advantage and the neutral nation is unable or unwilling to terminate this use, the disadvantaged belligerent has the right to attack its enemy in the neutral's territory.

Traditionally, the laws of neutrality did not require a neutral State to prevent its private entities from trading with belligerents.[365] However, increasing governmental control and involvement in trade led to the practical erosion of the distinction between private and governmental actors, and it is now commonly accepted that neutral States have an obligation to prevent acts of supply to belligerents by their private entities.[366] Since space law accords States responsibility over their private entities involved in space

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[363] Duncan, *supra* note 340 at 50.
[364] Hague Convention V *Respecting the Rights and Duties of Neutral Powers and Persons in Case of War on Land*, Oct. 18, 1907, 36 Stat. 2310, U.S.T. 540 [Hague V].
[365] McDougal and Feliciano, *supra* note 325 at 438, citing Hague Convention V, Article 7.
[366] *Ibid* at 443.

operations, an even stronger argument can be made to hold a neutral State responsible for the actions of its private entities.[367] In addition, when a State issues a license authorizing a private entity to provide certain services, there can be little argument that the State should be held responsible for subsequent conduct of the private entity. Accordingly, if a neutral State permits its space systems to be used by a belligerent military, the opposing belligerent would have the right to demand that the neutral State stop doing so. If the neutral State is unwilling or unable to prevent such use by one belligerent, it would seem reasonable to authorize the other belligerent to prevent the offending use. In the context of space systems used in time of conflict, before resorting to force a belligerent could (or should) demand a neutral nation not provide satellite imagery, navigation services, or weather information to its adversary.[368]

However, belligerents may have no similar right to limited self-defense in neutral territory when the use of satellite *communications* systems is involved. Articles 8 and 9 of the Hague Convention V provide that a neutral State is not required to restrict a belligerent's use of "telegraph or telephone cables or of wireless telegraph apparatus belonging to it or to Companies or private individuals" as long as these facilities are provided impartially to both belligerents.[369] Scholars point out, however, that the law of neutrality is heavily influenced by pragmatic factors such as power differentials between the parties to a conflict and nonparticipants; the intensity, time duration, and geographical scope of a conflict; and other available coercion techniques, including economic

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[367] Willson, David L., "An Army View of Neutrality in Space: Legal Options for Space Negation" (2001) 50 A.F. L. Rev. 175 (referring to the Outer Space Treaty and the Liability Convention).
[368] DOD General Counsel, "An Assessment of International Legal Issues in Information Operations" (May 1999).
[369] *Ibid.*; Hague V, *supra* note 364.

pressure.[370] There is no reason to believe that the application of the law of neutrality to space uses will be any different.

2. Civilians Controlling Space Systems: Unlawful Combatants?

A corollary to the problem of armed forces and civilian users relying on the same space systems is the increasing use of civilians in formerly military jobs. As traditional military functions are "outsourced" to civilians in an effort to save money, civilians often perform traditional military duties. In addition, civilian systems are providing certain information and services formerly provided by military systems. In space, this trend is especially noticeable in high-tech fields such as satellite control, ground systems maintenance, and satellite data-collection and interpretation.

The LOAC requires a distinction to be made between combatants and noncombatants.[371] Only combatants, who are members of a State's armed forces, have the right to participate directly in armed conflict. Under international law, to be a member of an armed force, a person must:

(a) Be 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 accordance with the laws and customs of war.[372]

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[370] McDougal and Feliciano, *supra* note 325 at 435.
[371] See above, section V(2)(a) for a discussion of LOAC principles.
[372] *Geneva Convention (I) for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field*, 12 August 1949, 75 U.N.T.S. 31, Article 13 [Geneva I]; *Convention (II) for the Amelioration of the Condition of the Wounded, Sick and Shipwrecked Members of Armed Forces at Sea*, 12 August 1949, 75 U.N.T.S. 85; *Convention (III) Relative to the Treatment of Prisoners of War*, 12 August 1949; 75 U.N.T.S. 135; *Convention (IV) Relative to the Protection of Civilian Persons in Time of War*, 12 August 1949, 75 U.N.T.S. 287.

Combatants must be distinguishable from noncombatants, and they must not use noncombatants or civilian property to shield themselves from attack. The status of "combatant" provides protection against punishment for combatant acts in case of capture by the enemy, as long as those acts complied with the LOAC. Combatants are subject to punishment for violations of the LOAC since they are "subject to an internal disciplinary system which [. . .] enforce[s] compliance with the rules of international law applicable in armed conflict."[373]

The term noncombatant is generally synonymous with civilian.[374] Civilians are not authorized to take a "direct part in the hostilities."[375] The International Committee of the Red Cross has defined direct participation as "acts of war which by their nature or purpose are likely to cause actual harm to the personnel and equipment of the enemy armed forces."[376] Persons who commit combatant acts without authorization are unlawful combatants and are subject to criminal prosecution.[377] If combatant acts are conducted by unauthorized persons, their national government may be in violation of the LOAC. In the context of space operations supporting armed conflict, the concepts of prohibited "hostile acts" and "direct participation" by civilians present difficult and complex issues.

The law of war has traditionally recognized that civilians may participate in a war effort without being declared unlawful combatants. However, acts *intended* or *likely*

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[373] *Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts (Protocol I)*, 8 June 1977, 16 I.L.M. 1391, Article 43.
[374] However, there are also certain members of the armed forces who are considered noncombatants, such as medical personnel and chaplains. George H. Aldrich, "The Laws of War on Land" (2000) 94 A.J.I.L. 42 [Aldrich].
[375] Michael N. Schmitt, *The Principle of Discrimination in 21st Century Warfare* (1999) 2 Yale H.R. & Dev. L.J. 143 at 149, citing *Protocol I* at Article 51.3.
[376] *Ibid.*

("hostile acts" and "direct participation", respectively) to cause actual harm to enemy armed forces are prohibited by noncombatants.[378] It is therefore generally agreed that noncombatant participation in activities such as weapons production, military engineering, and military troop transport is not prohibited, even though these acts ultimately harm an enemy. There is not such general agreement about whether the gathering and dissemination of intelligence and the transportation of weapons is direct participation. While the ICRC does not consider such acts to satisfy the definition of direct participation, the US military and several commentators assert they do.[379] Accordingly, civilians involved in space activities such as intelligence-gathering, interpretation, and dissemination for purposes of targeting, controlling unmanned weapons or surveillance vehicles, and engineering computerized information attacks are arguably participating directly in the hostilities.

> *Clearly, if the trend towards militarizing civilian activities and civilianizing military ones continues, the consequences for the principle of discrimination are grave. [. . .] As a practical matter the difficulty of determining who and what is, in fact, supporting the military effort will complicate discrimination. [. . .] Yet, as integration expands it will prove ever more difficult to determine with any precision the relationship of a potential target to the military effort.*[380]

In sum, the intermingling of civilians in traditional military space activities may in times of armed conflict lead to moral, ethical, and legal dilemmas, especially with regard to application of force. The increasing interdependence of the military and civilians in

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[377] Michael E. Guillory, "Civilianizing the Force: Is the United States Crossing the Rubicon" (2001) 51 A.F. L. Rev. 111 at 114 [Guillory].
[378] *Ibid.* See also Aldrich, *supra* note 374.
[379] Y. Sandoz, C. Swinarski, and B. Zimmerman, eds., *ICRC Commentary on the Additional Protocols of 8 June 1977 to the Geneva Conventions of 12 August 1949* (Geneva: ICRC, 1957); Hays Parks, "*Air War and the Law of War*" (1990) 32 A.F.L. Rev. 1; A.P.V. Rogers, *Law on the Battlefield* (1996), all cited in Guillory, *ibid.* at 117.
[380] Guillory, *ibid.* at 160-161.

space activities may also have unintended consequences in time of armed conflict; (1) civilians risk being characterized as unlawful combatants directly participating in hostilities and therefore being unprotected under LOAC; and (2) military reliance on civilian space systems may turn those systems into legitimate targets.

VI. Conclusion

Against a background of relatively permissive international space law, domestic law and policy should play an important role in regulating this novel area of potential discord and conflict. Because of concern about the dual use of space technology, some States[381] have made efforts to protect uncontrolled access to it in various ways, such as limiting access to space activities, as well as protecting access to space technology and space services. However, States must be careful seeking to protect their security interests, since the methods they employ may be counterproductive by causing political and legal controversy.

Today it is widely believed that national security is best protected by maintaining a healthy domestic industrial base in space technology and that policies supporting international competitiveness are necessary to achieve this end.[382] Some experts even assert that hurting the competitiveness of space companies in the global market could be more harmful to national security than letting cutting edge technology slip into the wrong hands.[383] Former US Defense Secretary William Perry once said that the criterion for export controls should be whether or not a country is the sole possessor of a given

[381] *E.g.*, the US, Canada, Japan, the United Kingdom, Russia, South Africa, Australia, and Sweden.
[382] *Space Commission, supra* note 360; see also US Chamber of Commerce, *Promote a Strong Domestic Space Launch Capability*, online: US Chamber of Commerce <http://www.uschamber.com/space/policy/launchcapability.htm>.

technology. "When technology being controlled is unique to the country trying to contain it, unilateral export controls work; however, they fail miserably when the technology is ubiquitous and only one country is trying to control it."[384] Arguably, the interdependence of military and commercial space systems has caused national security and competition to become mutually reinforcing, not competing goals.

At the same time, the increasing militarization of civilian space activities and "civilianization" of military space uses can have serious, and perhaps unintended, consequences. Policy decisions leading to an increase in civilian-military space interdependence must consider their potential impact on global trade, international relations, and the conduct of armed hostilities under the law of armed conflict. Thus, while "dual use" technologies and military reliance on civilian space systems raise legal and national security issues that require urgent consideration, they can also bring considerable benefits to all users when their respective concerns and interests are fairly addressed.

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[383] Broadbent, *supra* note 90.
[384] *Ibid.*

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