The Dilemma of National Security and International Cooperation in Outer Space:

Space Technology Trade and Proliferation Controls and their Impact on Global Civil Space Cooperation

By

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Abstract

In this thesis space technology trade and proliferation controls are analyzed, focusing on two substantive issues that illustrate the challenges and opportunities of reform. The first substantive issue examined is the challenge of domestic law and policy reform in light of international regulatory divergence. This issue is examined through a case study of the U.S. commercial communication satellite export control regime. The second issue is the international implications of space technology trade and proliferation control on global civil space cooperation.

The unifying demonstration of this doctoral thesis is that States operate in an international legal system that perpetuates a self-justified security dilemma whose basis originates in the sovereign legal right of States to produce, procure, and maintain space technologies of a military nature. As a result, the international legal system governing space technology trade and proliferation creates a tension between perceived national security needs and the benefits of global cooperation.

Résume

Cette thèse a pour objet l'étude des contrôles du commerce et de la prolifération de la technologie spatiale. Elle se concentre sur deux questions majeures illustrant d'une part les défis que poseraient une future réforme et d'autre part les perspectives que cette dernière serait susceptible d'ouvrir. La première question examinée est le défi posé par une réforme de la politique et du droit interne au regard de la diversité de la règlementation internationale. Elle est abordée à travers une étude de cas portant sur le régime américain de contrôle des exportations de satellites de communication. La seconde question concerne les conséquences internationales induites par le contrôle du commerce et de la prolifération de la technologie spatiale sur la coopération spatiale civile mondiale.

Cette thèse vise à démontrer que les Etats opèrent dans un système juridique international qui entretient un dilemme sécuritaire auto-justifié provenant du droit international des Etats à produire, acquérir et entretenir des technologies spatiales d'ordre militaire. Par conséquent, le système juridique international gouvernant le commerce et la prolifération de la technologie spatiale génère une tension entre les besoins de sécurité nationale tels qu'ils sont perçus et les bénéfices d'une coopération mondiale.

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Acronyms & Abbreviations

AECA	Arms Export Control Act
AKM	Apogee Kick Motor
ASAT	Anti-Satellite Weapons
BIS	Bureau of Industrial Security
CCL	Commerce Control List
CGEA	Community General Export Authorization
CGP	Controlled Goods Program
CGR	Controlled Goods Regulations
CJR	Commodity Jurisdiction Request
COCOM	Coordinating Committee for Multilateral Export Controls
COMSAT	Commercial Communication Satellite
DDTC	Directorate of Defense Trade Controls
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOS	Department of State
EAA	Export Administration Act
EAR	Export Administration Regulations
EC	European Commission
EU	European Union
ESCWA	U.N. Economic & Social Commission for Western Asia
FAA	Federal Aviation Administration
FAAA	Foreign Authorization Act
GEO	Geosynchronous Orbit
GPS	Global Positioning Satellites
HCOC	Hague Code of Conduct
IAASS	International Association for the Advancement of Space Safety
IADC	Inter-Agency Space Debris Coordination Committee
ICJ	International Court of Justice

IDA	Institute for Defense Analysis
IO	International Organization
ITU	International Telecommunication Union
ITAR	International Trafficking in Arms Regulations
IMINT	Imagery Intelligence
MASINT	Measurement and Signature Intelligence
MEO	Medium Earth Orbit
MINEFI	Ministry of Economy & Industry (France)
MOU	Memorandum of Understanding
MTCR	Missile Technology Control Regime
NEO	Near Earth Orbit
NGEA	National General Export Authorization
NSSO	National Space Security Office
OECD	Organization for Economic Co-operation and Development
OST	*Outer Space Treaty of 1967*
SETICE	Customs Office (France)
SIA	Satellite Industry Association of America
SIGINT	Signals Intelligence
SQUIPE	Space Qualified Parts and Equipment
STDA	*Strom Thurmond Defense Act of 1999*
TT&C	Tracking, Telemetry, & Control
TWTA	Traveling Wave Tube Amplifiers
UN	United Nations
USML	United States Munitions List
WMD	Weapons of Mass Destruction
WSO	World Space Organization

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Charts and Illustrations

Introduction

"*I believe that the long-term future of the human race must be in space. Our only chance of long term survival is not to remain inward looking on planet Earth, but to spread out into space*."

– Stephen Hawking[1]

"*After one look at this planet any visitor from outer space would say 'I want to see the manager.'* "

-William S. Burroughs[2]

Outer space is intimately related to our human future. Whether our future will be bright or bleak will depend, in part, on how we as a global community utilize outer space for our benefit and how we engage outer space as the next destination for humanity. Our journey begins here on Earth, in our terrestrial law and politics, in the decisions we make as a community of States and a community of people.

One critical element to human use and exploration of outer space is the underlying technologies that support such endeavors. Marvels of human ingenuity, space technologies have enabled people to garner the benefits of outer space. But space technologies are not ubiquitous. They are sophisticated and require a high-degree of economic and technical development. Almost all States and peoples of the world are impacted positively by outer space applications, but very few States have achieved access to outer space or have the capability to manufacture space vehicles or spacecraft (i.e. satellites). Given the advanced nature of space technologies, global civil cooperation in outer space has not been achieved. Instead, only certain States are directly involved in the development and utilization of outer space.

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[1]Stephen Hawking, statement made on 6 August 2010 regarding humanity's future and outer space on *BigThink.Com* at <http://bigthink.com/ideas/21691>.

[2] William Burroughs, attributed on *QuotationsPage.Com* at < http://www.quotationspage.com/quote/27694.html>.

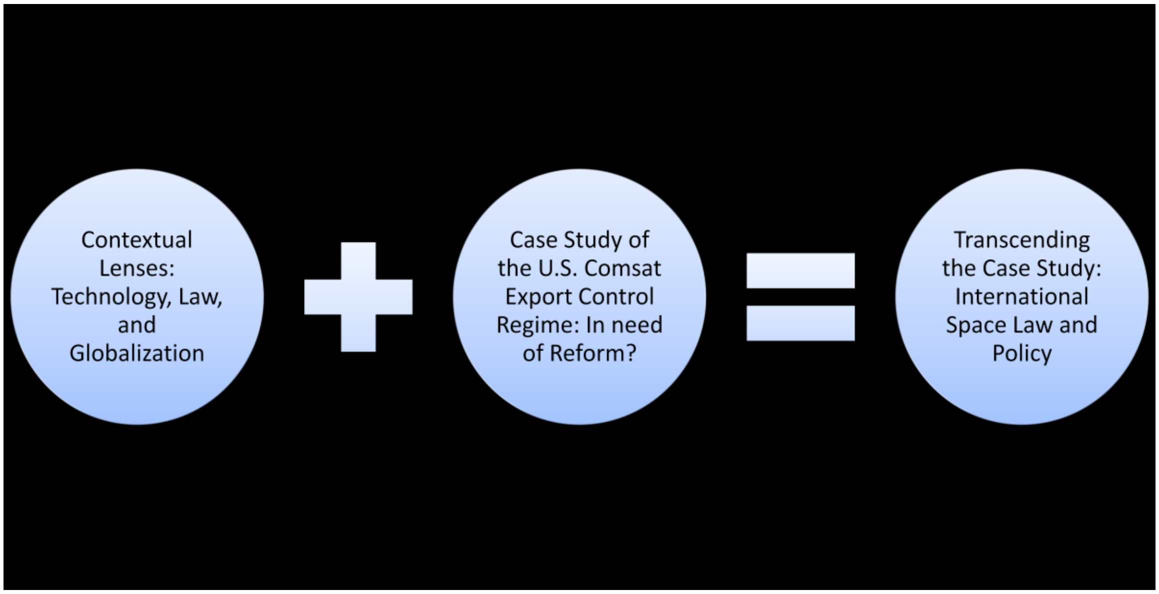
This current paradigm is supported by international and domestic space technology trade and proliferation controls. The current model of trade and proliferation controls prioritizes unilateral State "national security" concerns, which in turn perpetuates the use and exploration of outer space by only a select number of States through discriminatory technology engagement. Is there an alternative approach that better facilitates global civil space cooperation? And if so, what challenges and opportunities will it carry?

In this thesis, space technology trade and proliferation controls are analyzed, focusing on two substantive issues that illustrate the challenges and opportunities of reform. The first substantive issue examined is the challenge of domestic law and policy reform in light of international regulatory divergence. This issue is examined through a case study of the U.S. commercial communication satellite export control regime. The second issue evaluated is the international implication of space technology trade and proliferation control on global civil space cooperation.

The unifying demonstration of this doctoral thesis is that States operate within an international legal system that perpetuates a self-justified security dilemma whose basis originates in the sovereign legal right of States to produce, procure, and maintain space technologies of a military nature. As a result, the international legal system governing space technology trade and proliferation creates a tension between perceived national security needs and the benefits of global cooperation.

Methodological Outline of the Thesis

This thesis is divided into three parts. Part I is a primer, providing a contextual lenses for the subsequent case study. Part II examines the U.S. commercial communication satellite (Comsat) export control regime in detail, seeking to understand how it operates within the larger international legal, political, and economic framework. Within this case study, the focus of analysis is the inter-connectedness of the U.S. regime to the rest of the world and the extra-territorial implications of U.S. domestic law and policy. This case study provides a model of international and domestic space technology controls as it stands today. Part III elevates the analysis to the broader question of facilitating international civil space cooperation in light of international and national security concerns, building upon Part II case study conclusions.



The Domestic Implications for States: A Case Study of the United States

During the Cold-War, United States exports of satellites and related technology were controlled in cooperation with Western allies through coordinated domestic export control regimes. This Coordinating Committee on Multilateral Export Controls (COCOM) was a strategic tool to control the flow of technologies to the Soviet Union and its allies. As the Cold-War came to a close, the international environment changed significantly as international economic and political liberalization began to spread. The new 'globalized' environment challenged Cold-War notions of foreign policy and national security. The United States and her allies reassessed their strategy for controlling space related technologies and liberalized controls with regards to commercial and civilian satellites.

For a few years, U.S. and E.U. policy were closely aligned. However during the mid-1990s, in large part due to ballistic missile proliferation concerns associated with Chinese satellite launch vehicles, the United States reversed course and implemented law and policy that categorizes and regulates all U.S. origin satellite technology as munitions. Meanwhile, Europe has maintained liberalized dual-use export controls for commercial and civilian satellites.

At the end of the Cold War, the United States had a de facto monopoly on advanced Western space satellite technology. This technological superiority ensured that all Western manufactured satellites would have at least some component parts of U.S. origin. This technological fact allowed the U.S. to establish a de-facto unilateral international export control regime based on the application of domestic U.S. law extraterritorially via an export licensing regime that required U.S. authorization for re-export of U.S. origin parts.

Until recently, the costs and burdens associated with the U.S. export control regime have been shared amongst all satellite manufacturers and purchasers with U.S. origin parts. However there is now a question of whether and at what costs the United States can sustain its current satellite export control regime. The U.S. space industrial base is losing business due to the increased transaction costs associated with U.S. origin technology. Non-U.S. manufacturers are developing indigenous technologies to replace and compete with the United States. Europeans are selling their communication and civilian satellites as dual-use items, allowing satellites to be launched and operated by countries such as China.

For these reasons, the current satellite export control system is subject to significant criticism, and consensus is beginning to form on the need for reform. Recent legislative initiatives in the United States have brought the question of reform to the upper most levels of the Federal Government. One can anticipate space technology export control reform to be a significant legal development within the next five to ten years, if not sooner.

The discourse in the United States is currently focused on reform of the satellite export control regime as it relates to the Strom Thurmond Defense Act of 1999 and the legislative removal of Executive discretion to categorize satellites.[3] Current trends in Congress and the Obama administration indicate consensus is forming with regards to returning some or all of the discretion back to the Executive. While the debate on a process and domestic policy level is well hashed out, it fails to address deeper questions of international law and international relations that transcend the immediate policy question of satellite 'item' categorizations.

In this light, a case study of the aforementioned U.S. export and trade control of commercial communication satellites (Comsats) is undertaken in the following steps.

-First, the international legal environment in which Comsat and other space technologies are exported, traded, and controlled is examined. What international law is applicable to these technologies? How and why are international space technologies either controlled or *not* under international law?

-Second, particular focus is given to better understand the unilateral *de facto* international regime of U.S. Comsat export and trade controls. How does this regime function? Why has the United States instituted a unilateral regime? Is this regime sustainable?

-Third, the popular hypothesis that the United States is experiencing an economic erosion of its space industrial base because of domestic export controls without a concomitant strategic benefit is tested and challenged. The principal questions sought to be answered within this context are whether (1) the claims of economic and strategic costs-and-benefits are justified by quantitative and qualitative evidence? And (2) if so, why has the U.S. government failed to institute legal reform?

-Fourth, reform approaches to U.S. Comsat export controls are identified and assessed in light of U.S. national interests. What are the current conceptual assumptions within the reform discourse? What approaches are Congress and the Executive undertaking? What have these proposals failed to address?

[3] *See* P.L. 105-261 and U.S. House Resolution 2410, Section 826 (Pending in Senate).

In and of itself, this case study and the questions it seeks to answer should provide an original contribution to the field of space law and policy. But answering these questions is not the sole purpose of this thesis. Indeed, it is only a primer to a higher-level hypothesis regarding the future of human activity in outer space.

International Implications: Space Technology Trade and Proliferation Controls and Global Civil Space Cooperation

The most important finding of this aforementioned case study is that the current international paradigm of space technology controls is a national centric, primarily a unilateral paradigm in which States seek to maximize their legal discretion in exercising space technology trade and proliferation controls in the interests of "national security." This national centric paradigm is reflected in the absence of a legally binding supra-national space technology trade and proliferation control.

In Part III, Chapter 8 of this thesis, the impact of this national centric approach on global civil space cooperation is assessed. The primary purpose of this Chapter is to develop an understanding and analysis of how the current paradigm impacts global cooperation as one part of the larger puzzle of international law, international relations, and our collective human future in outer space.

This Chapter begins with an assessment of how the current international regime of space technology trade and proliferation controls impacts the ability of States to cooperate internationally on civil space endeavours. Thereafter, it addresses outer space arms control, disarmament, and proliferation and their link to international cooperation and space technology trade and proliferation controls. Three distinct international legal obligations are analyzed under the rubric of global space cooperation: the duty to maintain international peace and security, the obligation to promote cooperation and mutual understanding, and the obligation for the exploration and use of outer space to be for the benefit and interests of all countries.

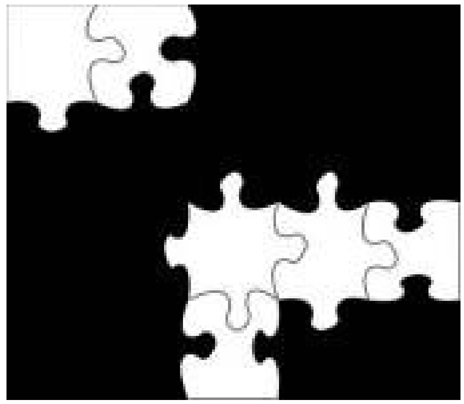
After that, the Chapter transitions to broader questions of international law, international relations, and philosophy. The establishment of a world space organization as well as a complementary global paradigm of space trade and technology controls is proposed, a 'self-justified' security dilemma that legitimizes the continuation of unilateral space activity is identified, forecasts are made as to the future of State relations if the current international framework of space technology trade and control perpetuates, and the historical legal-political evolution of State relations and outer space is analogized to Immanuel Kant's *Cosmopolitan Condition.*

The Analogy of a Puzzle

Attempting to understand the nexus between export controls, national security, space technologies, and international cooperation is a daunting task. In many ways this thesis is like a puzzle – but a puzzle with very unique characteristics. It is a puzzle in four-dimensions, expanding over space and time. The pieces of the puzzle are international law and international policy. Unlike most puzzles, this one does not come complete with all the pieces. It is an unfinished puzzle that humanity is building day-by-day. Every piece that has been laid down in the past helps define the parameters in which future pieces that will 'fit.'

In the general literature, the technical aspects of export controls are well hashed out. This is a piece of the puzzle properly understood. But examining only the technical puzzle piece of export control provides a limited picture. Missing is a substantial piece of the puzzle: the interconnectivity of space technology, export controls, and international cooperation in light of international and national security interests. Since no one has yet identified nor understood their interconnectivity, then how should one construct the picture? The approach adopted in this thesis is to start with a known piece, the U.S. export control regime governing commercial communication satellites, and build off of this knowledge to reveal the missing pieces. The logic behind this method is that if one is examining lacunae of law, it is first necessary to examine that law which does exist to determine that which is missing.

Consider the picture as illustrative.



If one assesses only the white puzzle pieces without considering the missing black pieces and the broader relationship of the pieces within the puzzle as a whole, one would only see six separate white pieces, four of which are connected in one group and two of which are connected a separate group. Missing from this perception would be connections between the two seemingly 'disparate' two groups of white pieces, as well as the 'unseen' black pieces. This lack of perception is derived from a perceptual gap that is rooted in conceptual presumptions and results in an inability to conceive of alternative relationships.

The puzzle of this thesis functions in a similar way. If one only looks at the known 'legislation and regulations' governing space export controls, but does not look at the broader interconnectivity of international law and international relations, then a substantial 'piece' of the puzzle is never seen. Yet it is exactly this 'unseen' piece that needs to be enlightened. Without this knowledge, the law and policy of space technology trade and proliferation controls will be advanced without full consideration of its broader impacts.

PART 1: An Examination of Preliminary Concerns – Contextual Lenses

The purpose of Part 1 is to examine the legal, technical, and international environment in which U.S. commercial communication satellite (Comsat) export controls operate. This examination is designed to raise questions and create a holistic context to better understanding the foregoing case study of U.S. Comsat export controls.

Chapter I

Technical Characteristics of Space Goods and Technology that are Relevant to Export Control

States implement Comsat export control systems through a licensing authorization process. Whether or not a license is granted and the conditions of the license are normally determined by three factors:

(1) The nature of the good and technology itself (e.g. whether it is militarily sensitive, subject to an international agreement, proscribed for national security)
(2) The end-user of the good and technology
(3) The intended end-use of the good and technology

But *what* are space goods and technology? And what are the critical technical characteristics of space technology that are relevant in export control law and policy?

This Chapter provides a technical examination of space goods and technology characteristics. It is designed to provide the reader with a sufficient understanding and background to understand *what* the U.S. is attempting to control and its most critical characteristics. Towards that end, this Chapter (1) defines space technology, (2) illustrates the dual-use characteristics of space technology, (3) identifies the military and intelligence significance of space applications, (4) explains the technology export control link between satellites, launch services, and ballistic missiles, and (5) theorizes on how future developments of space technology will impact export and proliferation controls.

A. Defining Space Technology

There is no consensus or accepted definition of the term "space technology." The etymological source of the term 'technology' is the Greek word *technologia*, the systematic treatment of an art, from *techne* art, skill + *o* + *logia* – logy.[4] In the broadest sense it is "the specialized aspects of a particular field of endeavor <educational technologies>" and in the more specific it is "the practical application of knowledge especially in a particular area"[5] But outer space is a location, not an endeavor and not an application. Is space technology therefore a word without true meaning?

If one accepts a geographic basis for defining technology, then space technologies are any technology that is designed, intended, deployed, or put into use in outer space or a celestial body. If one narrows the conceptual basis to an endeavor, then space technologies are any technologies designed, intended, or used in a space application.

Within the context of export control law, the term 'technology' often has a specialized definition and is not used as broadly as the conceptual definition aforementioned. A typical export control system prescribes regulations not only for physical goods or items that are exported, but also for technology. Export control regulations distinguish between the physical item and the specific information required for the development, production, or use of an item.[6] This specific information is the technology export controls seek to regulate and is usually classified as technical data or technical assistance.[7] This information can take both physical and non-physical form.

To make this even more confusing, the term "technology" is often used in the discourse to synonymously represent both physical goods *and their underlying technical*

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[4] *Merriam-Webster Online Dictionary*, *s.v.* "Technology" (2009).

[5] *Merriam-Webster Online Dictionary*, *s.v.* "Technology" (2009).

[6] *See* Canadian Export Control List, *Definitions*,(2009). *C.f.* International Trafficking in Arms Regulations, *United States Munitions List, 22* C.F.R. §120 (2009). The U.S. ITAR do not define technology. Instead they provide controls for and define defence services and articles, which incorporates 'technical data'. 'Technical data' includes: "Information, other than software as defined in § 120.10(a)(4), which is required for the design, development, production, manufacture, assembly, operation, repair, testing, maintenance or modification of defense articles. This includes information in the form of blueprints, drawings, photographs, plans, instructions or documentation." Defense services include: "The furnishing of assistance (including training) to foreign persons, whether in the United States or abroad in the design, development, engineering, manufacture, production, assembly, testing, repair, maintenance, modification, operation, demilitarization, destruction, processing or use of defense articles." In this sense U.S. ITAR distinguish between the physical good and the information required for development, production, and use of the good.

[7] *See* International Trafficking in Arms Regulations, *United States Munitions List, 22* C.F.R. §120 (2009).

knowledge. To resolve this ambiguity, one must recognize that unless specific legal language is referenced, it is likely that the technology discussed is assumed to include any associated physical goods. The reason for this is that concerns of unauthorized *technical knowledge* transfers are appropriately linked to the physical goods that are derived (e.g. manufactured) from the underlying technical knowledge. In other words, physical goods themselves can be a form of technical knowledge and are therefore often associated with the broader concept of *technology control.*

At this point it should also be noted that the term "satellite export controls" is a bit of a misnomer. A close examination of export control regulations reveals that while "spacecraft" as a single discrete good are controlled, regulations also govern space qualified items, associated propulsion and space related equipment. For convenience sake this thesis interchangeably uses the term "satellite" in lieu of spacecraft, space qualified items, associated propulsion and space related equipment (SQUIPE). However, it should be clearly understood that a significant amount of spacecraft associated exports are not the entire satellite spacecraft, but instead space qualified items, associated propulsion and space related equipment.

How space technologies are conceptually categorized depends on the determinative characteristics of the category. Function, use, size, and location are only a few possible determinative characteristics. Typically in export control regimes, space 'items' are divided into three broad categories related to the function of the space system the technology supports: (1) Launch Vehicle,[8] (2) Spacecraft,[9] and (3) Ground Support

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[8]Angelo Joseph, *Encyclopaedia of Space and Astronomy* (New York, N.Y.: Facts on File, 2006) at 349. An expendable (ELV) or reusable (RLV) rocket-propelled vehicle that provides sufficient thrust to place a spacecraft into orbit around Earth or to send a payload on an interdisciplinary trajectory to another celestial body. *Id.*

[9] Angelo Joseph, *Encyclopaedia of Space and Astronomy* (New York, N.Y.: Facts on File, 2006) at 556. In general, a human-occupied or uncrewed platform that is designed to be placed into an orbit about earth or into a trajectory to another celestial body. The spacecraft is essentially a combination of hardware that forms a space platform. IT provides structure, thermal control, wiring, and subsystem functions, such as attitude control, command, data handling, and power. Spacecraft come in all shapes and sizes, each tailored to meet the needs of a specific mission in space. Often they are categorized according to the missions they are intended to fly.*Id.*

Equipment.[10][11] Artificial satellites are one type of spacecraft. While these categories can be conceptually useful, the technological distinctions between them are not clearly demarcated. Technology from one category assists in the development and operation of technology in the other.

B. Dual-Use Characteristics

Dual-use goods (e.g. items and/or commodities) are goods capable of being used for both non-military and military applications. Dual-use technology is the specific information and associated knowledge required for the development, production, or use of an item. Dual-use goods and technologies have "both potential civil and potential military applications."[12]

In the United States export control system, the term 'dual-use' generally is used "to distinguish EAR [Commerce Department] controlled items that can be used both in military and other strategic uses and in civil applications from those that are weapons and military related use or design and subject to the controls of the Department of State or

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[10] Angelo Joseph, *Encyclopaedia of Space and Astronomy* (New York, N.Y.: Facts on File, 2006) at 282. Any nonflight (i.e. ground-based equipment used for launch, checkout, or in flight support of an aerospace vehicle, expendable rocket spacecraft, or payload. More specifically, GSE consists of nonflight equipment, devices, and implements that are required to inspect, test, adjust, calibrate, appraise, gauge, measure, repair, overhaul, assemble, transport, safeguard, record, store, or otherwise function in support of a rocket, space vehicle, or the like, either in the research and development phase or in the operational phase. In general, GSE is not considered to include land and buildings but may include equipment needed to support another item of GSE. *Id.*

[11] ITAR Regulations, *United States Munitions List, 22* C.F.R. §121 (2009). In the United States, ITARs (International Traffic in Arms Regulation) have specific categories for "*Launch Vehicles*, Guided Missiles, Ballistic Missiles, Rockets, Torpedoes, Bombs, and Mines," "Aircraft, *Spacecraft,* and Associated Equipment" and "*Spacecraft Systems* and associated equipment." *Id.*

[12] Anna Wetter, *Enforcing European Union Law on Export of Dual-Use Goods* (Oxford: Oxford University Press, 2009) at Glossary XV. *See also* John Heinz, *U.S. Strategic Trade: An Export Control Systems for the 1990s,* (Oxford: Westword Press, 1991) at 9. *See also Strategic Goods (Control) Act,* Singapore Statute Chapter 300. "'Dual-use goods' means goods capable of being used for both a non-military and a military purpose of relevant activity. 'Dual-use technology' means technology necessary for the development, production or use of any dual-use goods." *Id. See also* Sam Evans, "Defining Dual-Use: An international assessment of the discourses around technology" (Paper presented to the ESRC New Directions Conference in WMD Proliferation Seminar Series, 27 February 2009) [unpublished].

subject to the nuclear related controls of the Department of Energy or the Nuclear Regulatory Commission."[13]

Launch vehicles, satellites, and their underlying technology have inherently dual-use characteristics. The primary reasons for this is the (1) historical development of the technology, (2) the applications and uses of the technology, (3) the reluctance of States to deploy weaponized satellites or platforms, and (4) the unique role space applications have in modern civil, commercial, and military activities.

Expendable launch vehicles are essentially converted military ballistic missiles[14] and their technology and related technical knowledge are almost equivalent. For this reason the international community views space vehicles and ballistic missiles within the same technological category for weapons of mass destruction delivery mechanisms.[15] There are technical distinctions between space vehicles and ballistic missiles. These often include aspects related to the payload, boosters, and fairing systems. The payload and fairing technology is different because unlike spacecraft, ballistic payloads must be designed to survive atmospheric reentry and accurately target. Booster technology is different because the most effective military ballistic missiles use solid boosters to minimize launch preparation time while most space launch vehicles use liquid boosters. However, these differences do not preclude technology transfers between launch vehicle and ballistic missile programs. For example, the *Cox Commission Report* voiced concern that U.S. technical data and advice provided to a Chinese commercial launch service

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[13] Export Administration Regulations (United States), *Dual Use Exports,* 15 C.F.R. § 730.3 (2009).

[14] *See* Stanislav Nikolaevich Konyukhov, "Conversion of Missiles into Space Launch Vehicles" in the Encyclopedia of Space Science and Technology, Hans Mark eds., (New York: Wiley, 2003). Available online at: <http://www.mrw.interscience.wiley.com/emrw/9780471263869/esst/article/sst035/current/html>.

[15] *See International Code of Conduct against Ballistic Missile Proliferation*, also known as the *Hague Code of Conduct (HCOC) ,*implements transparency measures "to an appropriate and sufficient degree of detail to increase confidence and to promote non-proliferation of Ballistic Missiles capable of delivering weapons of mass destruction" for *both ballistic missile and space launch vehicle programs*.

provider regarding a failed launch vehicle faring system may have been transferred and applied to improve Chinese submarine ballistic missiles.[16]

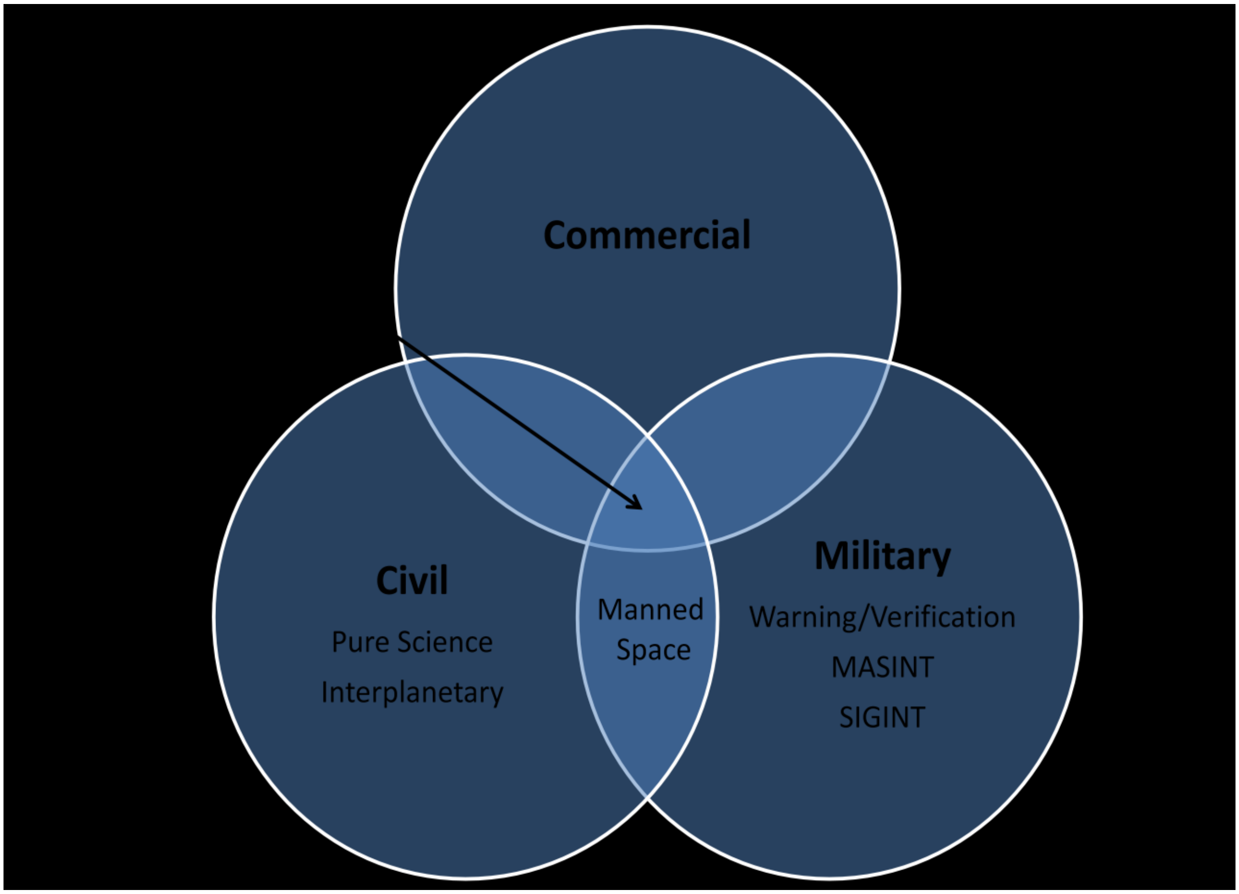
Satellites aren't generally considered 'dual-use' for their capacity to deliver an offensive weapon. This is because satellites have not yet been fully weaponized and no publicly known satellites have been deployed with the function or purpose of delivering WMD or conventional weapons.[17] Instead, satellites are considered 'dual-use' because of the (1) potential end-user application and/or (2) because components or subcomponents are deemed militarily sensitive.

Satellites can be categorized into three 'types' based on the end-user application: civil, commercial, and military (military can be subdivided into defense and intelligence). Certain types of satellites and space systems within the three categories are interdependent and inherently dual-use. The graphic below illustrates:

[16] *U.S. National Security and Military/Commercial Concerns with the People's Republic of China* (Cox Commission Report), Select Committee of the U.S. House of Representatives, 105th Congress, Report 105-851 (1999).

[17] *See* Michael Mineiro, "The United States and Legality of Outer Space Weaponization: A Proposal for Greater Transparency and Effective Dispute Resolution Mechanisms" 33 *Annals of Air and Space Law* 441 (2008).

Visualizing 'Dual-Use' Applications of Satellites[18]



This graphic illustrates that most satellite applications are dual use. Telecommunications, PNT, IMINT, weather, and space surveillance are all commonly used applications for the commercial, civil, and military space sectors. The United States military uses no less than eighteen civil and commercial satellites.[19]

What it doesn't illustrate is the interconnectivity of the component and subcomponent parts of all satellite and associated applications. From an export control

[18] This Chart was created by the author. It is based in part on a CSIS chart included in the "Briefing of the Working Group on the Health of the U.S. space industrial base and the impact of export controls" (February 2008) at 42.

[19] Tamar Mehuron, Ed., *2009 Space Alamanac: The U.S. military space operation in facts and figures* (Air Force Magazine, August 2009).

perspective this interconnectivity raises concerns about technology transfers due to sub-systems integration, anomaly resolution, and accident investigation.

To illustrate, an active communications satellite consists essentially of two parts, a payload and a bus.[20] "The payload contains the satellite's communications equipment and antennae that create an infrastructure for communicating with users throughout a continent or in regions or countries where service is supplied. The bus has the task of protecting the payload during the demanding launch period, placing the payload into its assigned orbit or orbital slot, and maintaining it there. The bus supports and maintains the payload throughout its lifetime."[21]

These two 'parts' of a communications satellite typically has the following seven subsystems:[22]

> **Payload:** The communications subsystem ("payload") contains the satellite's radio-frequency equipment. A wideband receiver at the front end of the subsystem accepts incoming communications channels that occupy a specified band of frequencies. Then the channels are separated according to frequency by a multiplexer, or bank of filters, and apportioned among the payload's various transponders. After amplification in the transponders, the channels are recombined by another multiplexer for retransmission to the ground.
>
> **Power:** The power subsystem generates, regulates, and controls power obtained from the solar arrays and onboard batteries primarily for use by the communications payload. This subsystem also maintains operation of the satellite during periodic solar eclipses.

[20] Steven Dorfman, "Technology of Telecommunication Satellites" in the Encyclopedia of Space Science and Technology, Hans Mark eds., (New York: Wiley, 2003). Available online at <http://www.mrw.interscience.wiley.com/emrw/9780471263869/esst/article/sst031/current/html>.

[21] Steven Dorfman, "Technology of Telecommunication Satellites" in the Encyclopedia of Space Science and Technology, Hans Mark eds., (New York: Wiley, 2003).

[22] Steven Dorfman, "Technology of Telecommunication Satellites" in the Encyclopedia of Space Science and Technology, Hans Mark eds., (New York: Wiley, 2003). The following seven explanations of subsystems are verbatim replications from Steven Dorfman's article.

Attitude Control: The attitude control subsystem senses any deviations from proper pointing directions and keeps the spacecraft and the antennae pointing in the correct directions—the solar arrays pointing toward the Sun and the radiators away from the Sun.

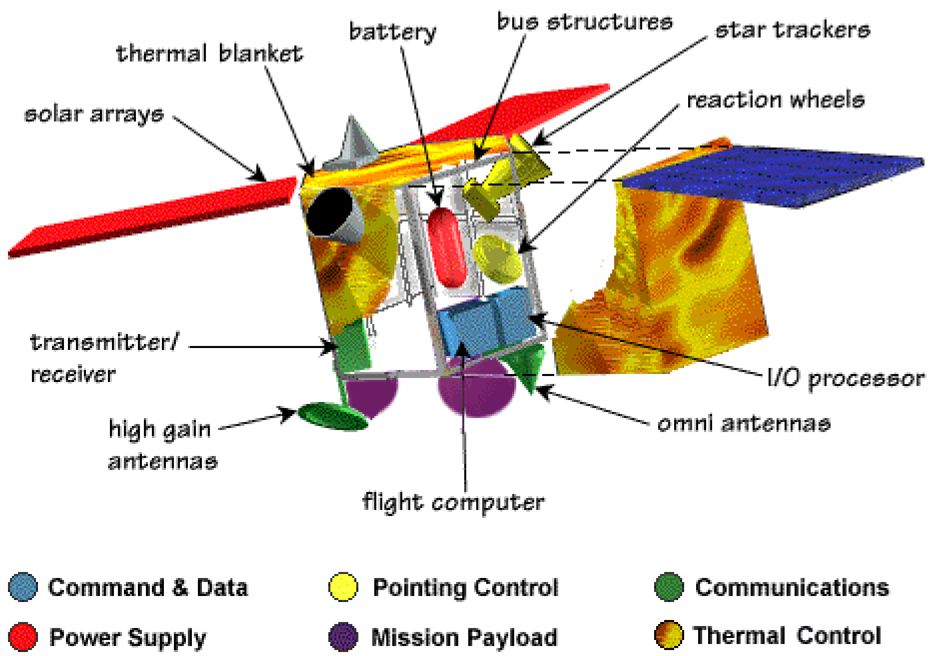
Propulsion: The propulsion subsystem generates thrust to place a GEO satellite into a desired orbital slot and to adjust its position periodically to offset movements in the (1) north–south direction due to solar and lunar gravitational attraction and (2) east–west direction due to the oblateness of Earth's poles. The last-named function is called stationkeeping. GEO satellites contain either a solid rocket apogee kick motor (AKM) or a liquid bipropellant (separate fuel and oxidizer) system. The function of the AKM and in part that of the bipropellant system is to insert the satellite into geosynchronous orbit when it reaches the apogee of a geosynchronous transfer orbit. The satellite is placed in an elliptical transfer orbit by a perigee kick motor during the final phase of the launch sequence. Besides performing the apogee kick function, the bipropellant system also helps raise the perigee of the transfer orbit to coincide with its apogee in geosynchronous orbit, a process called orbit raising. It also handles the stationkeeping duties. On satellites that have an AKM, a monopropellant system performs orbital positioning and stationkeeping duties. The tankage, valves, lines, thrusters, and fuel of this subsystem account for a significant portion of the mass of a satellite at launch and even after initial insertion into GEO orbit.

Thermal Control: The thermal control subsystem radiates the heat generated onboard the satellite into space. The thermal environment inside the satellite is kept at room temperature and all excess heat has to be radiated from the satellite. For this purpose, the subsystem uses such devices as thermal blankets and reflective mirrors. If the satellite has an AKM, as spinners do, an insulating wall and thermal barriers protect components from heat generated by the motor firing. New satellite designs are adding more traveling wave tube amplifiers (TWTAs) that have higher power outputs to their payloads. Despite increases in TWTA efficiency to as much as 70%, the remaining 30% is generated as useless heat that must be removed.

TT&C: The TT&C subsystem enables ground personnel to monitor the health and status of the satellite and issue commands to the satellite. It telemeters to the terrestrial TT&C station information regarding satellite temperatures, remaining fuel, TWTA performance, and pointing directions. The command portion accepts signals from the ground for controlling housekeeping functions, recharging batteries during solar eclipses, and dumping the energy buildup from the momentum wheels of a body-stabilized model. When the satellite comes to the end of its mission life as onboard fuel nears depletion, it can be commanded through the TT&C subsystem to deorbit and turn off its communications subsystem.

Structures: The structures subsystem is the chassis that provides physical support and protection for sensitive equipment during launch when the satellite must survive the effects of severe acoustic and vibrational forces. It employs a truncated cone or trusswork with panels for mounting bus and payload electronics.”

Communication Satellite Anatomy[23]



Depending on the intended end-use of a communication satellite payload, configuration, and subsystems may be modified. Often military communication satellites have specialized, enhanced, or modified subsystem components. A challenge for export control is determining which technologies should be categorized and regulated as militarily sensitive. With satellite technologies this is usually a question of degree. For example, military communication satellites typically have 'radiation hardened' devices to protect the satellite against potential electromagnetic attack. Commercial communication satellite operators also want radiation hardened devices, not to survive an attack, but to increase the survivability of a satellite in the event of a solar storm or other natural phenomena.[24]

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[23] Source of this graphic is: *ThinkQuest* at < http://library.thinkquest.org/C0122480/view.php?type=text&page=commsat_anatomy> (Last Accessed September 20th, 2009).

[24] For an interesting example of how radiation hardened satellite electronics are inherently dual-use, please review this Air Force SBIR bid solicitation: *Rapid Radiation Hardened Prototyping of Obsolescent*

C. Strategic Military and Intelligence Characteristics

The most important export control characteristic is not inherent in the space goods and technologies themselves, but instead is derived from the strategic advantages space based applications can provide to military and intelligence operations. Contemporary military and intelligence operations are supported by virtually every type and category of space technology.[25] Communications flow between commanders in the battlefield, missiles are guided by GPS, and intelligence satellites high above observe and report on relevant activity. They support a range of existing operations and they are essential elements to the future architectures of military and intelligence activity.[26]

D. Export Controls and Satellite Launches

Launch vehicles and ground support services are necessary for any satellite system to enter and maintain service. The issue of export controls of satellites directly relates to launch vehicles and ground support. This is because where, when, how, and with whom a satellite can be launched are all impacted by satellite export controls. If a U.S. national purchases a U.S. origin communication satellite for launch with a non-U.S. launch service provider then an export license is required. From a technology standpoint, a successful satellite launch requires a certain degree of technical cooperation between

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Military Satellite Microelectronics (Air Force SBIR 2009.3 - Topic AF093-081), Last accessed online on October 5th, 2009 at < http://www.dodsbir.net/Sitis/display_topic.asp?Bookmark=37584> . "PHASE III / DUAL USE: MILITARY APPLICATION: All military satellite programs could potentially benefit from the research towards rapid radiation hardened prototyping of obsolescent military satellite microelectronics. COMMERCIAL APPLICATION: Commercial satellites and many commercial electronics packages for use in harsh environments will benefit from the research towards rapid radiation hardened prototyping of obsolete microelectronics."

[25] *See* James Ferguson & Wilson W.S. Wong, *Military Space Power: A Reference Handbook (Contemporary Military, Strategic, and Security Issues)* (Praeger, 2010). *See* Clayton Chun, *Defending Space: U.S. Anti-satellite warfare and space weaponry* (New York, Osprey, 2006). *See* L. Parker Temple, *Shares of Gray: National Security and The Evolution of Space Reconnaissance* (AIAA, 2004). *See also* Donald Walsh, *Present and Future Military Uses of Outer Space: International Law, Politics, and the Practice of States* (LL.M. Thesis, McGill University Institute of Air & Space Law, 1986) [unpublished]. *See also* Frank Fedele, *Peacetime Reconnaissance from Air Space and Outer Space: A Study of Defensive Rights in Contemporary International Law*(LL.M Thesis, McGill University Institute of Air & Space Law, 1965) [unpublished].

[26] *See* Peter Hays, *U.S. Military and Outer Space: Prospectives, Plans, and Programs* (Routledge, 2009). *See* Robert Jarman, *The Law of Neutrality in Outer Space*, (LL.M. Thesis, McGill University Institute of Air & Space Law, 2008) [unpublished] at Chapter 2.

the launch and ground service providers and the satellite manufacturer/operator. *Ad minimum* technical assistance agreements are required for U.S. satellites launched by non-U.S. launch service providers. As a result the debate on reform of the U.S. satellite export control regime is intertwined with commercial launch services.

Whether or not technical cooperation can result in the proliferation and improvement of ballistic missile technology is a concern. The technical similarities between commercial launch vehicles and ballistic missiles imply that the technical knowledge required for a successful commercial satellite launch could also be used to improve ballistic missiles. This is a case-specific issue, dependent on the current level of launch technology used, the technical requirements for the satellite launch, and the nature of technical assistance provided.

E. The Future of Space Goods and Technology

Will the inherent dual-use characteristic of space goods and technologies evolve into inherently commercial, civil, and/or military technologies? *Perhaps*.

Since the end of the Cold War, the defense sector is increasingly focusing on dual-use and off-the-shelf goods and technologies.[27] In the aerospace industry, there has traditionally been a transfer of technology from military to civil applications.[28] More recently, this transfer flow has been reversed, from civil to military.[29] The increasing diversification of aerospace technologies into commercial and civil sectors is now providing a technology pool for the military to draw from. For example, launch vehicle[30]

[27] Derek Braddon, *Exploding the Myth? The Pace Dividend, Regions, and Market Adjustments* (Amsterdam: Harwood Academic, 2000) at 233.

[28] Derek Braddon, *Exploding the Myth? The Pace Dividend, Regions, and Market Adjustments* (Amsterdam: Harwood Academic, 2000) at 233.

[29] Derek Braddon, *Exploding the Myth? The Pace Dividend, Regions, and Market Adjustments* (Amsterdam: Harwood Academic, 2000) at 233.

[30] *See* Virgin Galactic website <http://www.virgingalactic.com/>. *See also* Space-X website < http://www.spacex.com/>.

and space habitat technology[31] *specifically for non-military use and application* are under commercial development.

This reverse-flow of technology blurs the distinction between civil, commercial, and military technologies, increasingly described as "dual-use." Civil and commercial technologies are evolving without intended dual-use purpose, but they still fail to distance themselves from the inherent dual-use characteristics of their technological heritage.[32]

As a result, the aforementioned question of whether or not the inherent dual-use characteristics of space technologies will evolve into inherently commercial, civil, and/or military characteristics is misleading. Due to the military strategic aspects of outer space, all space technologies are inherently dual-use. A more appropriate question is how they should be *regulated*. The answer to this question resides in choices of law and policy and is dependent on the national interests of an exporting State.

The implications of this choice are significant. It can be the difference between free and restricted trade, a weaponized or commercial industrial base, technological cooperation or competition, proliferation or non-proliferation.

F. Chapter Summary & Conclusions

The findings of this Chapter are that for export control purposes the most important technical and strategic characteristics of Comsats are: (1) satellite, launch, and ground service technologies are interrelated and (2) military and intelligence operations derive significant strategic advantage from space based applications. As will be examined in subsequent Chapters, the question of *how and why* these goods and technologies are and could be controlled need to be assessed in light of these technical and strategic characteristics.

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[31] *See* Bigelow Aerospace website < http://www.bigelowaerospace.com/>.

[32] Civilian GPS receivers, commercial human space flight technologies, and commercial remote sensing imagery are three examples of civilian/commercial technologies that are perceived and in some cases regulated as militarily sensitive items.

Chapter II

Sovereignty as the Legal Basis of Export Controls: International Law and Space Technology Controls

This chapter examines the international legal concept of a sovereign State as it is relevant to export control. This relationship between sovereignty and export control is important to the subsequent case study because the international legal concept of a sovereign State and the rights and obligations associated with sovereignty is the critical international law element upon which both international and domestic Comsat export control regimes are established and from which States exercise the legal right for export control regulatory preferences.

The current international legal environment is one in which each sovereign State has a unilateral space technology export control system. States may attempt to coordinate their domestic regulations, but there is no supranational authority to regulate and enforce. Only in unique circumstances does international law impose obligations to control space technology exports. The current paradigm of international law therefore limits the options available to sovereign States. Export controls that transcend the unilateral controls of an individual State must be obtained via voluntary bilateral or multilateral agreements and/or arrangements with other de jure States. There is no recognition of alternative cooperative export control arrangements that could supplement the State as the principal export control legal personality, disconnect the concept of territory from the spatial paradigm of export control, *or* allow for the control of technologies without the inclusion of the concept of an *export*.

Sovereignty contains with it ideas of national jurisdiction and territorial boundaries. One of the principal claims of sovereignty is "the ability of public authorities to control trans-border movements." [33] Export controls and sovereignty are often interlinked. But neither effective export controls nor exclusive sovereignty is necessarily

[33] Stephen Krasner, *Problematic Sovereignty* (New York: Colombia University Press, 2006) at 6.

predicated on and defined by the strict territory boundaries of independent States.[34] The linkage of sovereign jurisdiction, territory, and export control limits the enforcement capability of unilateral export control regimes in validation, transparency, and continuity of control. States have the right to regulate imported technologies as they deem in their best interests. Only international legal obligations can supersede this right.

A. Sovereignty as a Precondition to Export Control

If we push our minds to the most abstract, the control of exports need not necessarily be undertaken by a sovereign State. Any person or entity exercising coercive authority over the movement of anything (e.g. persons, goods, technology) 'exiting' the reach of its authoritative control is theoretically exercising export control. However such an exercise of authoritative control is not formerly recognized under international law.

Under international law, legally recognized export controls require a sovereign State to exercise its authority through legitimate and permissible bases of jurisdiction. This is because, subject to very special exception, only recognized States have the authority to exercise sovereign jurisdiction over territory, persons, natural resources, and that which is typically controlled in the export control context. When a non-State actor exercises coercive authority over the movement of goods, services, items, etc., but do so without legal authority from a sovereign State with justified jurisdiction over that which the coercive authority is exercised, it an illegal act under international law. In practice, such non-State actors who exercise coercive authority over the movement of persons, goods, and services are often categorized by legal authorities as pirates, thieves, robbers, terrorists, criminals, or rebels.[35]

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[34] *See* John Agnew, *Globalization & Sovereignty* (New York: Rowman & Littlefield, 2009) at 9.

[35] *See* Anthony Aust, *Handbook of International Law*, (Cambridge: Cambridge University Press, 2005) at 13. Aust supports the proposition that States are regarded by most authorities as the only subjects of international law, while natural persons and legal persons are generally *See*n as 'objects' of international law. *But See* Rebecca M.M. Wallace, *International Law 5th Edition*, (London: Sweet & Maxwell, 2005) at 1 -2. Wallace proposes States are not the only subjects of international law and other actors may be required to participate. However Wallace subsequently contradicts herself and adopts an alternative position when she states: "However, while States possess full international legal personality as an inherent attribute of their Statehood, all other entities possessing personality do so only to the extent that States allow: that is,

Consider for a moment the term 'export.' It has no formalized definition under international law.[36] Within domestic law, varying definitions exist. Customarily 'export', as a verb, means "to send, take or carry (a good or commodity) out of the country; to transport (merchandise) from one country to another in the course of trade."[37] Likewise, as a noun the term 'export' means "a product or service created in one country and transported to another."[38] Aubin & Idiart correctly recognize that, "Although the definition may vary according to the various applicable laws and regulations, export can be defined as an item that is sent from one country ('the country of exportation') to a foreign country ('the country of destination')."[39]

Exports exist as a legal concept directly linked to the sovereign State and its geographic boundaries from which an item is sent. This linkage to sovereign States means that territorial sovereignty is a necessary pre-condition to our current conception of exports and export controls.

I. Sovereign Authority and Export Control

Sovereign States are recognized as legal personalities under international law.[40] They are the legal 'beings' that regulate and enforce export controls. But how does a State achieve legal sovereign status under international law? And what are the

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their personality is derived via States." *Id.* at 63. *Compare* Teressa Fuentes-Camacho, ed., *The International Dimensions of Cyberspace Law*, (UNESCO Publishing/Ashgate, 2000). *Consider that* in cyberspace traditional forms of jurisdiction are challenged. These emerging areas of human activity do not fit within typical constructs of jurisdiction and export control.

[36] After extensive research I was surprised to find that no formal definition of export, as either a verb or noun, exists under international law. The term is used extensively in international agreements and arrangement but is never formally defined. The *Wassenaar Arrangement Declaration* does not define export. None of the *WTO Agreements* define export. The legal definition of the "export" remains within the domestic discretion of States. A strong argument exists that the custom of States has established a customary legal understanding of exports (verb and noun). Such a customary international legal definition would most likely parallel the definitions of export as adopted in *Black's Law Dictionary*.

[37] *Black's Law Dictionary*, 8th ed., *s.v.* "export"(vb).

[38] *Black's Law Dictionary*, 8th ed., *s.v.* "export" (noun).

[39] Yann Aubin & Arnaud Idiart, *Export Control Law and Regulation Handbook* (Kluwer Law International, 2007) at 4.

[40] *See* Malcolm N. Shaw, *International Law (5th Edition)*, (Cambridge: Cambridge University Press, 2003) at Chapter 5 "Subjects of International Law."

international rights, privileges, and obligations of a sovereign State as they relate to export controls?

States can be conceptualized as de jure and de facto.[41] As scholars of international law, the focus of our discourse is often on the de jure concept of sovereign States. However the conditions for a State de facto do not necessarily equate to the establishment of a State de jure.[42] There are two conceptual approaches as to whether or not a State de facto commands the legal status of a sovereign State.

The first approach is the proposition that once a State manifests certain characteristics de facto, thereafter implicitly the State commands de jure sovereign recognition under international law.[43] This is the Declarative Theory approach. The generally accepted criteria for a de facto state to act as a person of international law are: (a) permanent population, (b) defined territory, (c) a government; and (d) capacity to enter into relations with other states.[44]

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[41] *See* Ersun N. Kurtulus, "Theories of Sovereignty: An Interdisciplinary Approach" 18(4) Global Society (2004) at 361.

[42] *See Encyclopedia of International Law Vol. IV*, (Amsterdam: Max Plank Institute of Comparative Law, 1992-2001), Rudolph Bernhardt Ed., "Sovereignty" by Helmut Steinberger at 513. "Whether the status of sovereignty is acquired by a political entity as soon as it qualifies as State in the sense of international law, or whether such status depends in addition, in relation to other States, on its recognition as a State, is still controversial." *Id.*

[43] *See Encyclopedia of International Law Vol. IV*, (Amsterdam: Max Plank Institute of Comparative Law, 1992-2001), Rudolph Bernhardt Ed., "Subjects of International Law" by Hermann Mosler at 718. "It is generally agreed that newly arisen States are not outside international law.... Recognition cannot create an independent entity to which, by a general rule of international law, legal personality is not attached. Recognition is, however, significant in according a new State the possibility of putting its legal capacity into practice through relations with other members of the international community." *Id.*

[44] *See* Article 1, *Montevideo Convention*, 1993, 165 LNTS 19. *See also* The American Law Institute, *Restatement of the Law (3rd): Foreign Relations Law of the United States*, Vol.1 §201. *See also Encyclopedia of International Law Vol. IV*, (Amsterdam: Max Plank Institute of Comparative Law, 1992-2001), Rudolph Bernhardt Ed., "State" by Karl Doehring at 601. *See also* Anthony Aust, *Handbook of International Law*, (Cambridge: Cambridge University Press, 2005) at 16. *See Also see*, Rebecca M.M. Wallace & Olga Martin-Ortega, *International Law 6th Edition*, (London: Sweet & Maxwell, 2009) at 64. *See Opinion Number 1 of the Arbitration Commission of the European Conference of Yugoslavia,* 92 I.L.R., at 162 & 165. Stating that "the State is commonly defined as a community which consists of a territory and a population subject to an organized political authority" and "such a state is characterised by sovereignty." *Id.*

The second approach proposes that *only if* a de facto State is explicitly recognized as a legitimate international legal personality does it achieve the status of a de jure sovereign State.[45] This is the Constitutive Theory approach and its fundamental premise is that the international legal concept of a State is fundamentally reliant on the mutual recognition of de jure State members of the international legal community.

These theoretical underpinnings of a sovereign State have practical implications in the export control context. Multilateral export control agreements have only been undertaken as between recognized de jure sovereign States.[46] No other legal personality has been recognized under international law to have the jurisdiction and authority to implement domestic export controls, either unilaterally or within in a multilateral arrangement. If alternative forms of export controls are theorized, this critical legal fact must be considered. The reform and evolution of export controls will either continue to operate within this historical legal construct or it will depart from it. If departure is warranted then the legal and political challenges of change will need to be considered.

II. Domestic Sovereignty and Interdependence

A sovereign State is "to not be subject, within its territorial jurisdiction, to the governmental, executive, legislative, or judicial jurisdiction of a foreign State or to foreign law other than public international law."[47] Within this general concept of sovereignty, for the purposes of export controls it is useful to distinguish two distinct form of sovereignty: domestic sovereignty and interdependence sovereignty.

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[45] *See* Lassa Oppenheim (Ed. Ronald Roxburgh), *International Law: A Treatise* (The Lawbook Exchange, Ltd.; Clark, New Jersey; 2005) at 135: "International Law does not say that a State is not in existence as long as it is not recognized, but it takes no notice of it before its recognition. Through recognition only and exclusively a State become an International Person and a subject of International Law."

[46] There are a few special instances of informal bilateral export controls arrangements between State de jure and de facto, in which one or both State has not recognized the other as de jure subject to the Doctrine of Sovereign Equality. *See* the U.S. – Taiwan export control arrangements.

[47] *Encyclopedia of International Law Vol. IV*, (Amsterdam: Max Plank Institute of Comparative Law, 1992-2001), Rudolph Bernhardt Ed., "Sovereignty" by Helmut Steinberger at 513. *See* (as to the terminology adopted by Steinberger) *Reparation for Injuries Suffered in Service of the U.N.,* advisory opinion, *I.C.J. Reports 1949, p.* 174.

Domestic sovereignty can be conceptualized as "the organization of public authority within a state and to the level of effective control exercised by those holding authority," while interdependence sovereignty is "the ability of public authorities to control trans-border movements."[48] Export controls and enforcement should be assessed within the context of these two forms of sovereignty because both are a pre-requisite to effective *State* control and enforcement of exports. A sovereign State may institute domestic export control laws and enter into international agreements to coordinate exports. However, if a State lacks the ability to effectively exercise either domestic or interdependence sovereignty, its legal export control system may be *in practice* (1) a system controlled or seriously influenced by a foreign State and/or (2) a system of ineffectual control.

Examining the question of effective sovereign control also raises the question of whether there are alternative agents who can safeguard authorised technology transfers. *If* there are alternative paradigms to controlling goods and technology, then the issue of *effectiveness,* both what constitutes an effective control system and how it should be achieved, will need to be addressed. As will be discussed in subsequent Chapters, the question of effectiveness is directly related to the policy goals sought to be achieved and more generally to the underlying philosophical perspective of a particular policy.

B. Export Controls and Sovereign Jurisdiction

For a sovereign State to exercise legal control over an export, the State must do so on a basis of legitimate and permissible jurisdiction. Most often territorial jurisdiction is exercised to regulate and enforce exports. In some cases, nationality is also a basis. In theory, any permissible basis of jurisdiction could be relied upon to regulate or enforce export controls. Colloquially the limits of State jurisdiction are often described through five principles of international law: (1) the territorial principle, (2) the nationality

[48] Stephen Krasner, *Problematic Sovereignty* (New York: Colombia University Press, 2006) at 6.

principle, (3) the passive personality principle, (4) the protective principle, and (5) the universality principle.[49]

In addition to legal jurisdictional basis, effective export control requires two specific forms of jurisdictional implementation to regulate the exports and to enforce the regulation: "prescriptive" jurisdiction and "enforcement" jurisdiction.[50] "Prescriptive jurisdiction concerns a State's power to regulate or prescribe conduct, usually through the passage of law or regulation and the interpretation of such rules by domestic courts or tribunals."[51] "By contrast, enforcement jurisdiction concerns the power to take action consequent upon those rules, usually by way of executive or administrative action, and includes all measures of constraint aimed at securing compliance with such rule."[52] This distinction becomes particularly useful when examining export controls because an effective control regime must be able to internationally prescribe and enforce its regulations.

But how does an exporting State effectively and legitimately exercise jurisdiction and internationally prescribe and enforce its regulations, particularly against foreign nationals in foreign lands? An exporting State is going to need to enter into agreements and arrangements with importing States to provide for post-export control verification, enforcement, and more broadly technology safeguards.

From an export control perspective, there are three legal layers to effective technology safeguards, two of which focus on post-export control and enforcement:

1) Initial export control licensing (including license application review, investigation, due diligence),
2) A customs-to-customs MOU between the exporting and importing country,

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[49] *See* Bernhard Oxman, "Jurisdiction of States" in Rudolph Bernhardt, ed., *Encyclopaedia of International Law* (Elsevier, 1997). *See also* John H. Currie, *Public International Law*, 2d. ed. (Toronto: Irwin Law, 2008) .

[50] John H. Currie, *Public International Law*, 2d. ed. (Toronto: Irwin Law, 2008) at 334-335.

[51] John H. Currie, *Public International Law*, 2d. ed. (Toronto: Irwin Law, 2008) at 334-335.

[52] John H. Currie, *Public International Law*, 2d. ed. (Toronto: Irwin Law, 2008) at 334-335.

3) A strategic trade/safeguard agreement and/or multinational export control agreement/arrangement[53]

The initial export license granted from the State of origin is a legitimate exercise of State jurisdiction on the basis of territory and nationality. Whether or not an individual is a foreign person does not preclude the exporting State to exercise legitimate jurisdiction because that foreign person is operating from within and exporting out of the State. However once the controlled good or technology leaves the country of origin, establishing jurisdiction over foreign nationals in foreign lands requires legal cooperation and coordination with the importing State.

The first level of international arrangement is the customs-to-customs memorandum of understand (MOU). The customs-to-customs MOU "provides for mutual assistance agreement to prevent, investigate, and repress breaches of laws."[54] These MOUs establish a basis for one country's customs authorities to act on assistance requests from another.[55] However MOUs have several deficiencies. First and foremost is the ambiguity as to whether a particular MOU is a binding legal agreement. Whether or not an MOU is legally binding will vary from case to case, based upon the intent of the parties, position of the signatories, and language of the document.[56] Second, MOUs are often not registered in the United Nations Treaty Database. Non-registered MOUs cannot be invoked before any organ of the United Nations, including the ICJ.[57] Third, from a more practical perspective, custom-to-custom MOUs do not necessarily provide any

[53] Please note that multinational export control arrangements (such as the Wassenaar Arrangement) may also be included as another legal mechanism closely related in effect to a traditional bilateral strategic trade/safeguard agreement.

[54] John Heinz, *U.S. Strategic Trade: An Export Control Systems for the 1990s,* (Oxford: Westword Press, 1991) at 80-82.

[55] John Heinz, *U.S. Strategic Trade: An Export Control Systems for the 1990s,* (Oxford: Westword Press, 1991) at 80-82.

[56] *See Maritime Delimitation and Territorial Questions between Qatar and Bahrain (Qatar v. Bahrain)*, Judgment of 1 July 1994 (1994 ICJ Rep. 112). *See also*, *Maritime Delimitation and Territorial Questions between Qatar and Bahrain (Qatar v. Bahrain)*, Merits Judgment of 16 March 2001 (2001 ICJ Rep. 93). *See also*, Article 2(1)(a) of *Vienna Convention on the Law of Treaties*, 1155 U.N.T.S. 331 (23 May 1969).

[57] Article 102, *U.N. Charter*.

verification that the requests are being conducted completely and accurately by the host country's customs service.[58]

The MOU gap is filled by strategic trade/safeguard agreements. Strategic trade/safeguard agreements will typically provide for pre-license-post shipment checks that permit the exporting government to verify an export has arrived at the destination listed in the end-use certificate attached to the export license.[59] Exporting country officials are granted permission to perform random inspections and ensure verification of location and use. The country of import may also amend their laws to allow for restrictions on re-export, to provide a jurisdictional basis for the country of origin to investigate violations, and to establish criminal and civil sanctions for unauthorized re-exports and/or transfers.

Take for example the Canadian – U.S. technology safeguard agreements from the late 1990s. The U.S. suspended Canadian ITAR exemptions in 1999 due to security concerns over alleged unauthorized transfers of strategic goods to unfriendly countries.[60] The U.S. reinstituted Canadian exemptions after reaching an agreement with the Canadian Government to provide for technology safeguards deemed sufficient by the U.S. Government. The safeguards instituted by Canada include the amendment of the Defence Production Act, the establishment of the Controlled Goods Program (CGP), and the enactment of the Controlled Goods Regulations (CGR). If a Canadian export listed as a Controlled Good contains U.S. origin parts subject to International Trafficking in Arms Regulations (ITAR), which is virtually all satellite related equipment, re-export authorization is required from the Canadian Government.[61] Violators are subject to

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[58] John Heinz, *U.S. Strategic Trade: An Export Control Systems for the 1990s,* (Oxford: Westword Press, 1991) at 80-82.

[59] John Heinz, *U.S. Strategic Trade: An Export Control Systems for the 1990s,* (Oxford: Westword Press, 1991) at 80-82.

[60] *See* Eric Chao & Sorin Niculescu, "*The Impact of U.S. Export Controls on the Canadian Space Industry"* 22(1) Space Policy 29 (2006).

[61] *See* Canadian Export Control List §5504 (2009). *See also*, Export Permit Regulations, SOR/97-204, §(3)(2)(c) (2009).

criminal and civil sanctions from the Canadian Government with criminal sanctions of up to ten years in prison and a fine in the discretion of the court *per violation*.[62]

Multinational export control arrangements closely parallel bilateral strategic trade/safeguard agreements in that they seek to coordinate and harmonize member States national legislation and regulations with regards to specific exports.

C. International Legal Obligations of a State to Control Exports of Spacecraft and Launch Vehicle Technology

Each State enjoys the rights inherent in full sovereignty.[63] With regards to export controls, it is the sovereign right of States to exercise "exclusive power or jurisdiction over territory and population" that is most important.[64] Through the exercise of this right States control exports within its jurisdiction as it deems in its best interests. Control can be either act or omission (by choosing not to control).

The exercise of this general right of exclusive control over exports is subject to requirements of international law. Theoretically, international law may impose obligations upon States to control exports. Such an obligation could even take the form of requiring a State to allow an item to be exported. There are four sources of international law that could impose such an obligation: U.N. Security Council resolutions, binding international agreements (e.g. treaties), customary international law, and peremptory norms of international law (jus cogens). In addition, States enter non-binding agreements that impose political (but not legal) obligation.

I. Security Council Resolutions

Under the U.N. Charter the Security Council has the authority to control the export of satellite technologies *if* the exportation (or denial of exportation) of the

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[62] *Defense Production Act,* R.S., 1985, c.D-1, Part 3 §44 (2009).

[63] *See Declaration on Principles of International Law Concerning Friendly Relations and Cooperation Among States*, G.A. Res. 2625 (XXV), 1883rd Plenary Meeting, (24 October 1970).

[64] John H. Currie, *Public International Law*, 2d. ed. (Toronto: Irwin Law, 2008) at 39.

technology subject to the Council order constitutes a "threat to peace, breach of peace, or act of aggression."[65] The U.N. Security Council has never passed a resolution controlling the export of satellite technologies per se. This is because contemporary satellite technology does not generally constitute the possibility of its exportation causing a threat to international security in the typical paradigm of conventional terrestrial weapons or weapons of mass destruction.[66] But keep in mind that a satellite is nothing more than a man-made object that orbits the Earth or celestial body. The term satellite does not tell us about its capacity or intended use.[67] Satellite technologies could be created whose export is deemed by the U.N. Security Council as constituting a threat to international peace and security. The capabilities of such satellite technologies could vary from kinetic to electromagnetic or to others not yet imagined. In such an event, the international community may create a new classification of weapons deemed Weapons of Space Destruction (WSD) and their proliferation would be considered intrinsically a threat to international peace and security.[68]

The origins of this legal evolution are observed in U.N. Security Council Resolution 1540. The international community has shown increasing concern with the proliferation of WMD and their delivery mechanisms. The proliferation of these items demonstrates a "threat to international peace and security" and has warranted the attention of the U.N. Security Council.[69] Acting under Chapter VII of the U.N. Charter,

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[65] *U.N. Charter,* Article 39.

[66] *See* e.g. Security Council Resolution 1737 (2006) [reaffirmed in Security Council Resolution 1874 (2009)] establishes an arms embargo on North Korea. This embargo requires Member States to prevent the direct or indirect supply of embargoed items, hence requiring export controls with regards to North Korea. The control lists (*See* Document S/2006/814 and S/2006/815) embargo space vehicles but not space vehicle payloads per se. The concern of the international community (as manifested in these documents) is the space vehicle/ballistic missile technology, not satellite payload technology per se.

[67] Given the current status of spacecraft technology and the export control discourse related to spacecraft and satellites, any space based system (e.g. spacecraft) that is in orbit is a satellite and therefore falls within the penumbra of satellite export controls. In other words, for export control purposes satellite and spacecraft are synonymous.

[68] Another interesting question is how the deployment of "weaponized" space systems will be received by the international community and controlled under international law. These questions of space system weaponization raise broader questions of human evolution in outer space and our collective human future in outer space.

[69] *U.N. Security Council Resolution 1540,* UN Doc. S/Res/1540 (2004).

the Security Council has imposed obligations upon States with regards to export controls that impact the right of States to export satellite technologies, to the extent a satellite could be used to deliver a WMD from orbit to a terrestrial location. If a satellite is specifically designed for such use, Resolution 1540 imposes affirmative duties upon Member States to control their export.[70] Likewise, satellite materials, equipment and technology could be used for the design, development, production or use of a 'means of delivering' a WMD and are also subject to the resolution.[71]

II. Treaties

There are no publicly known[72] binding multilateral treaties whose specific subject matter is satellite technology export controls. Certain multilateral arms control treaties do have space technology as weapon delivery systems within their purview.[73] In addition, some multilateral treaties prohibit the deployment or operation of specific space systems.[74]

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[70] *See U.N. Security Council Resolution 1540,* UN Doc. S/Res/1540 (2004); defines "means of delivery" as "missiles, rockets and other unmanned systems capable of delivering nuclear, chemical, or biological weapons that are specially designed for such use."

[71] *See U.N. Security Council Resolution 1540,* UN Doc. S/Res/1540 (2004); defines "related materials" as "materials, equipment and technology covered by relevant multilateral treaties and arrangements, or included on national control lists, which could be used for the design, development, production or use of nuclear, chemical and biological weapons and their means of delivery."

[72] It is quite possible there are arrangements and possibly even legal agreements of a secretive nature that govern satellite and other space technologies. This author cannot confirm or deny their existence. Consider that in the world of State relations treaties, MOUs and other diplomatic exchanges are sometimes done without public knowledge.

[73] *See* e.g., *Treaty on the Non-Proliferation of Nuclear Weapons,* 729 U.N.T.S. 161 (entered into force 5 March 1970). *See also Treaty Between the United States and the Union of Soviet Republics on the Limitation of Anti-ballistic missile systems (AMB Treaty),* (Entered into force October 3, 1972; rescinded by the United States in 2002). The ABM treaty prohibited the development, testing, or deployment of space-based AMB satellite systems, but did *not* impose any technology export control obligations.

[74] *See* Michael Mineiro, "The United States and the Legality of Outer Space Weaponization: A Proposal for greater Transparency and a Dispute Resolution Mechanism" XXXIII Annals of Air & Space Law 441 (2008). *See* e.g., *Treaty on Principles Governing the Activities of States in Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,* 18 .U.S.T. 2410 (entered into force 27 January 1967). *See also* e.g., *Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques,* 1108 U.N.T.S. 151 (18 May 1977). *See also* e.g. *Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water*, 480 U.N.T.S. 43 (5 August 1963).

In some cases, bilateral treaties explicitly deal with export controls. These treaties most often seek to exempt the respective States from particular domestic export control licensing requirements.[75] However, it is more common for such a result to be achieved via domestic legislative and regulatory action instead of a bilateral treaty.[76] This provides both the exporting and importing State with the discretion to legally modify its export control law and regulations *at will* because they are not subject to an instrument of international law.

III. Non-Binding Arrangements and Guidelines

There is only one publicly known non-binding export control arrangement that lists specific satellite technologies within its purview: The Wassenaar Arrangement. There are two other international arrangements that directly address *launch vehicle space technologies* and are only a secondary concern with regards to satellite technology controls: the MTCR and Hague Code of Conduct.

a. The Wassenaar Arrangement

The Coordinating Committee for Multilateral Export Controls (COCOM) was a Cold-War organization of Western States that coordinated exports of sensitive items that could be used to contribute to military potential and proliferation of weapon systems and was in fact "designed to impose an embargo on Western States' exports on Socialist

[75] *See* e.g. *Treaty between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the United States of America concerning Defense Trade Cooperation.* [Treaty is Not Yet in Force and Remains Subject to Ratification by the U.S. Senate].

[76] Canada is granted special license exemptions under U.S. regulations governing the exportation of defence items (ITARs). *See*, *Defence Trade, Lessons to be Learned from the Country Export Exemption*, GAO Report to the Subcommittee on Readiness and Management Support, Committee on Armed Services, I.S. Senate, GAO-02-62 (March 2002). *See also* defense articles and services that are controlled on the U.S. Munitions List (22 C.F.R., secs. 120-130).

Countries."[77] Satellites and satellite technologies were within the purview of COCOM control lists and served as the basis for U.S. international technology control.[78]

In 1994, COCOM was dissolved and in 1996 the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Good and Technologies (Wassenaar Arrangement) was adopted as the post-Cold War replacement. Wassenaar is designed not to impose an embargo on specific States but instead "to contribute to regional and international security, by promoting transparency and greater responsibility in transfers of conventional arms and dual-use goods and technologies."[79] Unlike COCOM, licensing decisions for items on control lists do *not* require consent of fellow arrangement Members.[80] Instead, the decision to transfer or deny transfer of any item is the sole responsibility of each Participating State.[81] All measures undertaken with respect to the Arrangement are in accordance with national legislation and policies and are implemented on the basis of national discretion.[82] As a result Wassenaar's primary usefulness is as an export control transparency arrangement.

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[77] Yann Aubin & Arnaud Idiart, *Export Control Law and Regulation Handbook* (Kluwer Law International, 2007) at 52. *Consider that* a group of Communist States led by Union of Soviet Socialist Republics had a similar Cold-war multilateral technology export control arrangement.

[78] Joan Johnson-Freese, "Alice in Licenseland: U.S. Satellite Export Control since 1990" 16 Space Policy 195 (2000) at 198.

[79] *The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies* (hereafter referred to as the "*Wassenaar Arrangement"),* Initial Elements: Statement of Purposes, para.1 adopted by the Plenary of 11-12 July 1996 and as exceptionally amended by the Plenary of 6-7 December 2001. *See also* Richard Cupitt & Suzette Grillot, "COCOM is Dead, Long Live COCOM: Persistence and Change in Multilateral Security Institutions" 27 B.J. Pol. S. 361 at 387 (1997). "Members of the now defunct COCOM structure began evolving their national and multilateral practices towards a system meant to make access to strategic items freer for non-military end-uses. In the post-Cold War world, members of the Wassenaar Arrangement prefer to facilitate access to technology for post-communist states, rather than co-ordinate its denial, in their desire to promote international trade and encourage democracy." *Id.*

[80] *See* Richard Cupitt & Suzette Grillot, "COCOM is Dead, Long Live COCOM: Persistence and Change in Multilateral Security Institutions" 27 B.J. Pol. S. 361 (1997) at 364. "Decisions on some licences were subject to COCOM review. These licence decisions, and decisions to modify the lists of controlled items or proscribed countries, required unanimous consent. This meant that the country with the most stringent control standards, generally the United States, held a veto over all licences subject to review and over the deletion of items." *Id. See* Jamil Jaffer, "Strengthening the Wassenaar Export Control Regime" 3 Chi. J. Intl. 519 (2002).

[81] *Wassenaar Arrangement* at Scope, para.3.

[82] *Wassenaar Arrangement* at Scope, para.3.

The Arrangement is applicable to conventional arms and dual-use technologies set forth in its "List of Dual-Use Goods and Technologies and in its Munitions List."[83] Participating States must notify transfers and denials of listed items. The Dual-Use List has two annexed categories: Sensitive and Very Sensitive Items.[84] Certain space technologies, including satellite technologies, are listed as dual-use goods and technologies, sensitive and very sensitive.[85]

b. MTCR and Hague Code of Conduct

The Guidelines for Sensitive Missile-Relevant Transfers (MTCR) arrangement, as between Participant States, coordinates controls of transfer that could make a contribution to deliver systems other than manned aircraft for weapons of mass destruction. This includes missile related equipment, materials, software and technology. Category I of the Annex concerns complete rocket systems, including space launch vehicles and sounding rockets. The MTCR rests on adherence to common export policy guidelines (the MTCR Guidelines) applied to an integral common list of controlled items (the MTCR Equipment, Software and Technology Annex).[86] All MTCR decisions are taken by consensus, and MTCR partners regularly exchange information about relevant national export licensing issues.[87]

The International Code of Conduct against Ballistic Missile Proliferation (Hague Code of Conduct/HCOC) is aimed at bolstering efforts to curb ballistic missile proliferation worldwide and to further delegitimize such proliferation.[88] The HCOC

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[83] *Wassenaar Arrangement*. *See also* Yann Aubin & Arnaud Idiart, *Export Control Law and Regulation Handbook* (Kluwer Law International, 2007) at 53.

[84] *Wassenaar Arrangement*. *See also* Yann Aubin & Arnaud Idiart, *Export Control Law and Regulation Handbook* (Kluwer Law International, 2007) at 53.

[85] *See Wassenaar Arrangement,* List of Dual-Use Goods and Technologies. For example Category 9 "Aerospace and Prolusion," Category 1 "Advanced Materials," Category 3 "Electronics," and Category 7 "Navigation and Avionics."

[86] MTCR website <http://www.mtcr.info/english/> (Last accessed on 22 September 2009).

[87] MTCR website <http://www.mtcr.info/english/> (Last accessed on 22 September 2009).

[88] *See The Hague Code of Conduct Against Ballistic Missile Proliferation* (HCOC) U.S. State Department Fact Sheet, <http://www.fas.org/asmp/resources/govern/ICOC-6January2004.html> (Last accessed on 22 September 2009).

consists of a set of general principles, modest commitments, and limited confidence-building measures.[89] It is intended to supplement, not supplant, the Missile Technology Control Regime (MTCR), and is administered collectively by all of the Subscribing States.[90] As it relates to launch vehicle technology export control, Subscribing States must "exercise the necessary vigilance in consideration of assistance to space launch vehicle program in any other countries" and promote the "non-proliferation" of ballistic missiles capable of delivering weapons of mass destruction.[91]

Both the MTCR and HCOC are of only secondary concern within the satellite export control context because the subject matter of their controls and the items listed on their control lists are not explicitly satellite technologies. Only when a satellite technology is also used within the context of a parallel controlled item (e.g. apogee kick motors or radiation hardened devices) do these control arrangement impact satellite technology exports.

IV. Customary and Peremptory Norms of International Law

Customary norms and norms jus cogens are two recognized sources of international law.[92] Customary international law "derives from the practice of States and is accepted by them as legally binding."[93] The constituent elements of "practice and opinion juris" are necessary for the existence of binding international customary rules.[94] A norm *jus cogens* is a "mandatory or peremptory norm of general international law

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[89] *See* HCOC U.S. State Department Fact Sheet, <http://www.fas.org/asmp/resources/govern/ICOC-6January2004.html> (Last accessed on 22 September 2009).

[90] *See* HCOC U.S. State Department Fact Sheet, <http://www.fas.org/asmp/resources/govern/ICOC-6January2004.html> (Last accessed on 22 September 2009).

[91] *The Hague Code of Conduct Against Ballistic Missile Proliferation* (HCOC) (formally brought into effect on 25 November 2002).

[92] *See* Article 38 of the *Statute of the International Court of Justice*. *See also Encyclopedia of International Law Vol. IV*, (Amsterdam: Max Plank Institute of Comparative Law, 1992-2001), Rudolph Bernhardt Ed., "Customary International Law" by Rudolph Bernhardt.

[93] *Black's Law Dictionary*, 8th ed., *s.v.* "customary international law."

[94] *See Encyclopedia of International Law Vol. IV*, (Amsterdam: Max Plank Institute of Comparative Law, 1992-2001), Rudolph Bernhardt Ed., "Customary International Law" by Rudolph Bernhardt.

accepted and recognized by the international community as a norm from which no derogation is permitted."[95]

With specific regards to satellite and satellite technology export controls, there is no customary rule of international law mandating or conditioning control. Norms *Jus cogens* may mandate or condition control *if* the underlying rational for a peremptory norm is triggered. It is generally accepted that certain norms of international law have the status of *jus cogens*. Violations are commonly exampled as "the use of force contrary to the principles of the U.N. Charter," "commission of acts such as trade in slave, piracy, and genocide," and other acts that violate "the basic human rights of every person."[96] What is fascinating is that underlying the exampled rules of current jus cogens are legal rationales. Principal amongst these is that there are certain obligations that should exist *erga omnes* (i.e. in relation to all States) and by their very nature form part of *jus cogens.*

Looking towards the future evolutionary of international law, the logic of peremptory norms *erga omnes* may one day apply to export controls governing satellites and other space technologies. Three particular scenarios, if they arise in the future, will provide the necessary collective self-interest of the international community to justify controls as *jus cogens.* These scenarios are as follows:

1) the survival of the human species depends on the control of particular space technologies; and/or,
2) the discovery of extraterrestrial life (either sentient or non-sentient) requires the international community to control particular space technologies to ensure either our protection or the protection of the extraterrestrial life; and/or,
3) International peace and security is threatened by the development or proliferation of a particular space technology to such an extent the

[95] Article 53 of *Vienna Convention on the Law of Treaties*, 1155 U.N.T.S. 331 (23 May 1969). *See also Black's Law Dictionary*, 8th ed., *s.v.* "Jus Cogens."

[96] *Encyclopedia of International Law Vol. IV*, (Amsterdam: Max Plank Institute of Comparative Law, 1992-2001), Rudolph Bernhardt Ed., "Jus Cogens" by Jochen Abr. Frowein at 66-67.

international community reaches a consensus that a peremptory norm should apply.

For example, in the future satellites and satellite technology may have the capacity to destroy humanity or prevent humanity from destruction.[97] Satellites could have the ability to stop a near earth object from impacting earth (in which case this is a technology of preventing the destruction of humanity). Satellites could also develop to have the ability to modify terrestrial weather to such an extent as to pose a threat to the human species (in which case this is a technology actively capable of destroying humanity). In either of these cases, a norm *jus cogens* to control and utilize the technology could come to fruition. Likewise if extraterrestrial life is discovered, if human use of spacecraft could endanger this extraterrestrial life or our relationship with it (in the event it is sentient life), it is highly probable that international law will evolve to control this relevant technology under a norm of *jus cogens*.[98] With regards to the threats to international peace and security, the development of global weather modification space-platforms is one example of space technologies that could be deemed prohibited *jus cogens*.

D. Sovereignty and the Form and Structure of the U.S. Commercial Communication Satellite (Comsat) Technology Export Control Regime

The aforementioned relationship between sovereignty and export control directly impacts the form and structure of the U.S. Comsat export control regime. While the regime is described in greater detailed in the subsequent case study, for the time being let

[97] Consider e.g., satellites may develop the capacity to cause life-alternating modifications to the environment. For a more detailed examination of satellites and the legality of environmental modification, *See* Michael Mineiro, "The United States and the Legality of Outer Space Weaponization: A Proposal for greater Transparency and a Dispute Resolution Mechanism" XXXIII Annals of Air & Space Law 441 (2008) at 458-459. Also consider e.g., satellites may have the ability to deflect near-earth-objects that threaten life on Earth.

[98] Such a scenario becomes extremely plausible in the event humanity "discovers" sentient life. For an interesting examination of law and alien life, please *See* the work of Andrew J. Haley and his theories of metalaw. *See* Ernst Fasan, *Relations with Alien Intelligence; the scientific basis of metalaw*, (Berlin: Berlin Verlag, 1970).

us look at the overall structure of the regime as it relates to perceived and applied conceptions of legal sovereignty.

The United States regime is literally written by Congress and implemented by the Executive. The sovereign State of the United States has a recognized legitimized government represented internationally by the President of the United States and duly appointed representatives. Congress is the domestic legislative authority, the law maker within the domestic sovereign context.

The export control regime governing Comsats originates in Congressional legislation and is implemented by Executive regulation. In instances where a legally bound treaty is relevant, Congress has approved the treaty and it is appropriately integrated into the regulatory structure. In cases of non-binding arrangement, the Executive can only adhere to measures in accordance with national legislation.

As a result, the U.S. export control system is just that - - a United States national system. It is not an international export control system. The United States, indeed all States, are given significant discretion to determine what space technologies they will develop and trade. The U.S. may attempt to coordinate with other sovereign States, but no supranational authority is granted to coordinate, regulate, and enforce. In other words, the U.S. system is a unilateral export control system. It operates as one legal island in a world of hundreds. Political power (in all its varieties) is used to coerce and convenience fellow States to cooperate. From a game theory perspective, the U.S. system operates in a non-zero sum system with a self-constructed rule system (with the exception of norms of international law applicable to export controls).[99]

E. Chapter Summary & Conclusions

The concept of the "sovereign State" and related conceptions of sovereign jurisdiction, in particular those related to geography and territory, are the legal bases

[99] In other words, the international system of States is (1) not necessarily zero-sum [e.g. when one State gains it is offset by an equal loss for other States] and (2) the States create the rules of the games [e.g. the rules of international law are not imposed by an outside authority].

upon which modern export controls are constructed. This paradigm is often assumed, and is definitely implied, in the domestic legislative structures of State export control systems, including the United States.

As will be discussed in subsequent Chapters, this paradigm of sovereign control dominates the literature and discourse associated with export control. Indeed, the entire field of international law is based, at least in part, on the acceptance of sovereign States as the primary actors on international law. It is important keep in mind the overarching legal structure of sovereignty and its influence on domestic export control law, policy, and discourse.

This Chapter has also provided an outline of the international law governing space technologies more broadly. The two primary categories of space technology, launch vehicles and spacecraft, are subject to limited obligation for control under international law. Launch vehicle technologies, due to their close relationship with ballistic missile deliver systems, have been the subject of greater international agreement and arrangement coordination. But spacecraft related technologies are virtually absent from binding international law.

Chapter III

Policy, Economic, and Techno Globalization

"Everything changes, nothing remains without change"[100]

Export controls are legal mechanisms that control the movement and transfer of goods and technology. The movements and transfers they seek to control are international. It is therefore important to gauge the international environment in which export controls operate.

This Chapter identifies and explains three international phenomena associated with globalization that are intimately linked to the law and policy challenges of Comsat export controls: policy, economic, and techno globalization. These three phenomena are the principal non-legal characteristics of the post-cold war international environment that are transforming international relations and challenging the effectiveness of United States export control of satellite technologies.

A. Three Phenomena of Globalization

Change is constant; it is the nature of the human experience. That which we call 'society,' its laws and social institutions, is malleable and ephemeral. The only constant within the shifting sands of human experience are the humans themselves, and even that constant is only relative temporally. With the appropriate perspective one can observe the change (often termed evolution) of that most consistent of our relative biological constants. Yet this truth of change does not alter the realities of the present. Humanity builds, destroys, and creates. Hunger and pain, joy and sadness, human needs continue. So we construct terms and ideas that attempt to describe the ever shifting experience.

[100] Hindu Prince Gautama Siddhartha, the founder of *Buddhism*, 563-483 B.C. (Quoted in Kobina Wright, "Ten Great Quotes on Change" *The American Chronicle* (23 October 2008), online: American Chronicle <http://www.americanchronicle.com>

Globalization is one such idea that humanity has constructed in attempt to describe the changing international environment. To globalize is literally "the action, process, or fact of making global."[101] The "global" world view as we know it today began taking formation in the period between the sixteenth and eighteenth centuries.[102] It was during this period of time that the first human circumnavigation of the Earth occurred. The Copernican revolution ushered in a new era conceiving the Earth as a sphere orbiting within a heliocentric system. The Earth and her *human* political, economic, and social elements literally began to be viewed on a "global scale," albeit without necessarily the state-centered perspective we hold today.[103]

But what is the phenomenon we call 'globalization'? The rhetoric of globalization is subject to significant academic criticism, often attacked as term of mythical proportions, a "buzzword" without any substantial meaning.[104] "In popular discourse, globalization often functions as little more than a synonym for one or more of the following phenomena: the pursuit of classical liberal (or "free market") policies in the world economy ("economic liberalization"), the growing dominance of Western (or even American) forms of political, economic, and cultural life ("westernization" or "Americanization"), the proliferation of new information and communication technologies (the "Internet Revolution" and "Broadband Communications"), as well as the notion that humanity stands at the threshold of realizing one single unified community in which major sources of social conflict ought to vanish ("global

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[101] *Oxford English Diction Online*, "globalization (*n*)" (Last Accessed on 25 September 2009).

[102] John Agnew, *Globalization & Sovereignty* (New York: Rowman & Littlefield, 2009) at 12.

[103] John Agnew, *Globalization & Sovereignty* (New York: Rowman & Littlefield, 2009) at 12.

[104] *See* Gillian Teubne, *Defining a Changing World: The Discourse of Globalization* (Ph.D Thesis, Texas A&M University, 2004) [unpublished] at abstract iii. "Globalization has, within academic, political and business circles alike, become a prominent buzzword of the past decade, conjuring a diversity of associations, connotations and attendant mythologies." *Id. See also* B.Strath, "The State and its critics: is there a post-modern challenger?" in Q. Skinner & B. Strath eds., *States and Citizens: History, Theory, Prospects* (Cambridge: Cambridge University Press, 2003) at 178. "Globalization rhetoric has taken on mythical proportions, in Roland Barthes's view of myth as the transformation of the cultural products of history into something apparently natural." *Id. See also The Stanford Encyclopedia of Philosophy Online*, "globalization" (Last Accessed on 25 September 2009). "Covering a wide range of distinct political, economic, and cultural trends, the term "globalization" has quickly become one of the most fashionable buzzwords of contemporary political and academic debate." *Id.*

integration").” There is no consensus on the meaning of the term ‘globalization’ or whether or not the phenomenon exists at all.[105]

To simply assess ‘globalization’ would be too unwieldy, too vague, too undefined to support substantial analysis. Instead we must focus our thoughts on particular characteristics that are relevant to the case study and analysis undertaken in subsequent Chapters. There are three phenomena within the larger context of globalization that are particularly relevant to the challenges of national export controls. There three phenomena are: (1) policy globalization, (2) economic globalization, and (3) techno globalization.

I. Policy Globalization

Policy globalization is the harmonization and coordination of State law and policy at an international level. Since the end of the World War II, the international community has seen a significant rise in cooperation amongst States to harmonize and coordinate their national laws and policies. Quantitatively and qualitatively a marked increase in international coordination is evidenced.[106] Increasingly standards and practices for an array of civilian, commercial, and military activities are subject to international mechanisms of law and policy coordination.

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[105] Gillian Teubne, *Defining a Changing World: The Discourse of Globalization* (Ph.D Thesis, Texas A&M University, 2004) [unpublished] at 2.

[106] Since World War II there has been a significant quantitative increase in the number of treaties and other agreements and arrangements between States. Qualitatively, the subject matter international agreements are increasingly covering a broad array of policy subjects (civil aviation, international trade, telecommunications, environmental, etc.). These agreements and arrangements take various forms, ranging from multilateral treaties, bilateral treaties, arrangements, MOUs, codes of conduct, and executive arrangements. *See* Robert O. Keohane & Craig N. Murphy, “International Institutions” in May Hawkesworth & Maurice Kogan eds., *Encyclopedia of Government and Politics, 2nd Edition,* (New York: Routledge, 2004) at 913-915. Keohane & Murphy note that: “The increasing institutionalization of aspects of world politics is indicated not only by the growth in numbers and activity levels of international organizations but also by the increased scope of international regimes. After the Second World War, international regimes were established to deal with issues of exchange rates, trade, reconstruction, food and agriculture, and airline transportation, among others. In the 1950s the conception of economic development led to a proliferation of organizations devoted to it, and hope for peaceful uses of nuclear energy led to the International Atomic Energy Agency. Recently we have witnessed the emergence of regimes governing debt, human rights, and various aspects of the global environment. Yet institutionalization remains uneven by issue area. For instance, there is still no global international regime for petroleum production and marketing, much less for energy or raw materials in general and there are no major multilateral conventions on issues as important as tax and antitrust law.”

What is surprisingly absent in this general trend of policy globalization is satellite export controls. As mentioned earlier, there is no legally binding international commitment on satellite export control. COCOM, the strongest non-legal arrangement governing SQUIPE goods and technology export control that has existed to date, was dissolved at the end of the Cold War. Its replacement, the Wassenaar agreement, is not structured to achieve the same level of coordination that COCOM achieved and is primarily a transparency arrangement. In our era of globalization, satellite export controls are the exception to the trend of policy globalization. Why is this so? And what are the ramifications of this observed *policy domestication* of space technology export controls for global cooperation in outer space?

II. Economic Globalization

Economic globalization is a term used to describe more broadly the integration of local and national markets and associated means of production and capital to a regional and global level. According to the United Nations ESCWA, "when used in an economic context, it [globalization] refers to the reduction and removal of barriers between national borders in order to facilitate the flow of goods, capital, services and labor...".[107] The Organization for Economic Cooperation and Development (OECD) describes economic globalization as a term "widely used to describe the increasing internationalization of financial markets and of markets for goods and services. [Economic] Globalization refers above all to a dynamic and multidimensional process whereby national resources become more and more internationally mobile while national economies become increasingly interdependent."[108]

The commercial satellite industry operates within, and indeed enhances,[109] the paradigm of economic globalization. The impact of globalization on the industry is

[107] "Summary of the Annual Review of Developments in Globalization and Regional Integration in the Countries of the ESCWA Region by the United Nations Economic and Social Commission for Western Asia" (UN Doc. E/ESCWA/GRID/2002/2) at 1.

[108] OECD's "Measuring Globalization: Handbook on Economic Globalization Indicators" (2005) at 11.

[109] *See* Hugh R, Slotten, "Satellite Communications, Globalization, and the Cold War" 43(2) *Technology and Culture* 315 (2002). Dr Slotten refers to the communication satellite as "an essential instrument of

multifaceted. It increases the market size, creates a more competitive satellite product and services market, supports international supply chains, increases potential sources of capital, and changes the relative economics of research & development.[110] Export controls are, in part, trade restrictions against economic integration associated with economic globalization.[111] An assessment of the economic impact of export controls must consider how they restrict (or facilitate) economic globalization.

III. Techno Globalization

In current scholarly discourse there is no concept that accurately describes the underlying flow of technology, technical knowledge, and technological innovation that characterizes our globalizing era. It is proposed that an idea of "techno globalization" be considered to describe this characteristic.

The term "techno globalization" does exist in the public discourse, but it is not used within the context of export control and technological innovation. It has manifested

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globalization." *See* Oliver Boyd-Barrett, "International Communication and Globalization: Contradictions and Directions" in Ali Mohammadi Ed., *International Communication and Globalization*, (London, Sage Publishing: 1997) at 14. Mr. Boyd-Barrett recognizes that communication satellites have contributed to the development of transnational communication infrastructures central to the modern phenomena of globalization.

[110] *See* Theodore Levitt, "The Globalization of Markets" *Harvard Business Review* (May-June 1983). Mr. Levitt addresses the impact of globalization on markets. *See* Gary Hufbaurer & Tony Warren, "The Globalization of Services: What has happened? What are the implications?" *Working Paper 9912: Institute for International Economics* (1999) at 4. Hufbaurer and Warren identify quantitative increases in cross-border trade in the telecommunication sector utilizing WTO trade data. *See Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007), available online at the U.S. Bureau of Industry and Security <http://www.bis.doc.gov/defenseindustrialbaseprograms/osies/defmarketresearchrpts/exportcontrolfinalreport08-31-07master___3---bis-net-link-version---101707-receipt-from-afrl.pdf>. The NSSO report identifies that the relative economics of research & development changes within a globalized satellite marketplace. Consider also that in the aerospace manufacturing sector global supply chain manufacturing is being used on certain projects. For example, Boeing Corporation's most recent commercial passenger aircraft, the 787 *Dreamliner*, is a product of a global supply manufacturing with varying results. *See* Stanley Holmes, "Boeing's Global Strategy Takes Off" *Businesweek Online* (30 January 2006) <http://www.businessweek.com/magazine/content/06_05/b3969417.htm>. *But See* Dominic Gates, "Former 787 chief says Boeing Rethinking its global manufacturing approach" *Seattle Times Online* (31 October 2007) <http://seattletimes.nwsource.com/html/boeingaerospace/2003986302_webbair01.html>.

[111] *See* Charles Shotwell, "Export Controls: A Clash of Imperative" in Richard Kulger & Ellen Frost eds., *The Global Century: Globalization and National Security,* (University Press of the Pacific: 2002).

itself in the study of technology and public discourse (film and literature), [112] techno-entrepreneurship, [113] techno-security, [114] the role of technology in 'driving' globalization,[115] the relationship between globalization and technological systems,[116] and socio-technical development.[117] But there is no consensus on its meaning and it has been conceptually modified depending on the context. It is therefore necessary to create a conceptual understanding of the term within the context of globalization that is relevant to export controls.

The scholar S. M. Montresor asks a question that arises within the context of export control law and policy: How does technological innovation form? Montresor hypothesizes that "the introduction and the diffusion of new products, processes and organization forms do not occur in isolation. They are instead the result of complex interactions between different kinds of 'agents' within geography and history specific contexts" and are "systemic in nature." [118]

The question of innovation is crucial because technology is the result of human thought and endeavour. It is hypothesized that export law and policy challenges hinge *not*

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[112] Jason Abbott, "Living in The Matrix: Capitalism, Techno-Globalization and the Hegemonic Construction of Space," Montreal, 2004 (Paper presented at the annual meeting of the International Studies Association, Le Centre Sheraton Hotel, Montreal, Quebec, Canada, Mar 17, 2004) [unpublished]. *See also*, William Ford Gibson novels.

[113] Leonard Lynn and Hal Salzman, "Multinationals, Techno-Enterprises, and the Globalization of Technology Value Chains" (Paper presented at the Global Social Networks and Industry Roadmapping Session: *Sloan Industry Studies Conference*, Boston, April, 2008) [unpublished].

[114] Denis Simon, *Techno-Security in an Age of Globalization: Perspectives from the Pacific Rim* (M.e.Sharpe, 1996).

[115] Al D. McCready, "Strategic Technology Planning for the Techno-Global Economy: Cities in the Market" in Mila Gasco-Hernandez & Teresa Torres-Coronas, eds. *Information Communication Technologies and City Marketing: Digital Opportunities for Cities Around the World* (ICI Global, 2009).

[116] Sando Montresor, "Techno-globalism, techno-nationalism and technological systems: organizing the evidence" (2001) 21 Technovation 399-412. Montresor proposes a concept of "technological systems" and examines these systems within a taxonomy to distinguish its implication for those element of "technological systems" which "are more related to the State from those which are closer the idea of a nation." Montresor discusses this systemic process within the context of what he terms "techno-globalization."

[117] Borisz Szanto, "The paradigm of Globalism" (2001) 21 Technovation 673-687.

[118] Sando Montresor, "Techno-globalism, techno-nationalism and technological systems: organizing the evidence" (2001) 21 Technovation 399-412 at 401.

solely on process or procedure, but also on the fundamental assumptions of purpose: e.g., what is the goal of the U.S. satellite and space technology control regime? And space technology export controls in general? Necessarily linked to the question of purpose are the questions of technology, innovation, and control. This is because an export control regime deals *not only with* physical goods, but also the underlying innovative structures and technical knowledge that is ultimately manifested in a technical application. It is therefore important to have a conceptual reference to assess the underlying flow of technology, technical knowledge, and technological innovation that characterizes our globalizing era. *Techno Globalization* is such a concept.

The following definition of *Techno Globalization* is proposed:

> *Techno globalization* is the accelerating proliferation of technologies, and its underlying technical knowledge, beyond the human networks of technical innovation that were traditionally defined by territory. Spatial location and territorial delimitation, while still influencing human networks, no longer necessarily dominate their structure[119] Underlying this proliferation are increasingly integrated transnational human communication networks that facilitate emergent forms of human innovation systems.

A consistency in human history has been the discovery, development, and proliferation of technologies. The acceleration of technology proliferation and associated human networks buttressing innovation is not in and of itself a unique historical development warranting distinct as a subset of globalization. But there are particular characteristics of the current globalized era justify distinguishing

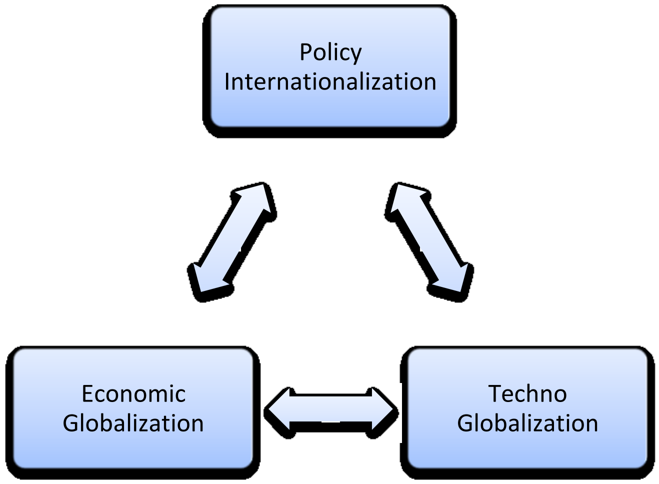
[119]*Consider that* transnational innovation systems also exist alongside "national" or "spatially bound" systems. *C.F.* Daniele Archibugi et al., "Innovation Systems in a Global Economy" 11(4) *Technology Analysis & Strategic Management* 527 (1999) at 528. Archibugi et al. correctly identify that "the concepts of national (or spatially bounded) systems of innovation and technology systems should not be *See*n as mutually exclusive. Indeed, establishing the interrelationships between the two can yield valuable insights into the wider systems of innovation approach."

the phenomena of “techno globalization” from the general trend of human knowledge and technical development.

First, techno globalization is occurring on a truly global scale. In principle, the increasing integrated transnational networks of communication can provide accessibility to knowledge and innovation on a scale without historical precedent. Second, techno globalization is occurring within a particular structure of human governance structures that is unique to our current historical period. Central to the current structure of global governance is the centrality of States as geo-political legal persons tasked with primary jurisdictional authority over land, water, and air within discrete geographic boundaries, as well as the persons within their boundaries. Techno globalization’s manifestation as a distinct phenomenon arises, in part, from the erosion of the State’s traditional authority to control on the basis of spatial location and territorial delimitation. Third, the speed at which technical innovation can develop is unprecedented, derived in part from synergetic human networks operating within communication and innovation systems that provide efficiency gains in production in light of costs associated with network development, use, and maintenance.

B. The Relationship between these Three Phenomena

Policy, economic, and techno globalization are interconnected phenomena, synergistically influencing and contributing to the development of the other. They are in fact interlinked in a ‘feedback’ system.



As between policy and economic globalization, economic globalization is occurring within the context of an international system of sovereign States.[120] States, as the basic units of the community and policy, are entering into legally binding agreements to harmonize national laws and facilitate economic integration. Economic globalization (as we know it) only exists, in part, as a result of the *law, policy, and administrative mechanisms that sovereign States provide.* In turn, policy globalization provides the international political foundation upon which economic globalization is developing. Similarly, the innovation and associated communication networks of techno globalization are built upon the legal and politic arrangements facilitated by policy globalization.

C. Observed Manifestations of Globalization

As between economic and techno globalization, four manifestations of their interaction are of particular relevance to export controls:

[120] It is recognized that non-State actors pay an important role in international economic activity, including the phenomenon of economic globalization. Furthermore, it is recognized that non-State actors contribute to the development of internationally binding and non-binding rules facilitating economic globalization and even operate in the own structure of norms. However, international law is still fundamentally posited by the Sovereign State. The primarily legal personality through which the rules of international trade and the associated phenomena of globalization occur is still the State.

1) From the structure of the underlying communication networks that facilitate economic globalization, the phenomenon of techno globalization emerges.[121]
2) Global outsourcing of manufacturing results in the proliferation of technical knowledge and the creation of new innovation systems.[122]
3) Globalized innovation systems create technologies and technical applications that are adopted by State and non-state actors.[123]
4) Commercial research and development costs associated with technologies can now be supported by capital flows generated via global markets.[124] This allows for accelerated technical development.

D. Chapter Summary & Conclusions

The aforementioned three phenomena of globalization bring to light substantial distinctions that are relevant to an analysis of export control law and policy. First, policy globalization draws an important distinction between the legal-political integration of sovereign States and economic integration. Second, economic globalization distinguishes economic integration from other phenomena of globalization. This provides a more focused contextual lens for economic analysis of export controls. Third, techno-globalization identifies that goods and technologies derive from *human innovation and creation* and that globalization is changing how technology is developed and transferred.

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[121] *See generally* regarding theories of communication networks and emergent properties, Peter R. Moore & Noshir Contractor, *Theories of Communication Networks,* (Oxford, Oxford University Press: 2003).

[122] *Consider that* while there is a debate as to whether or not global sourcing can provide a sustainable advantage, it is generally agreed that outsourcing results in the proliferation of technical knowledge and the creation of new innovation systems. *See* Masaaki Kotabe & Janet Y. Murray, "Global Sourcing Strategy and Sustainable Competitive Advantage" 33(1) Industrial Marketing Management 7 (2004); referring to lack of consensus as to the effect of outsourcing and identifying long-term consequences. *See also* Tomas Hult, "Cultural Competitiveness in Global Sourcing" 31(1) Industrial Marketing Management 25 (2002); examining innovation and organizational learning as they pertain to global outsourcing.

[123] *See* Daniele Archibugi et al., "Innovation Systems in a Global Economy" 11(4) *Technology Analysis & Strategic Management* 527 (1999) at 534. Archibugi et al. hypothesizes a cyclical process wherein "technology has facilitated globalization and vice-versa." One element of this process is that new innovation systems create new technologies and technical applications, or as described by, "the process of generating and diffusing new technologies has been moulded and strengthened by the flows of individuals, commodities and capital."

[124] *See generally* Rene Stulz, "Globalization, Corporate Finance, and the Cost of Capital" 12(3) *Journal of Applied Corporate Finance* 8 (1999).

Together these three phenomena of globalization help explain the tensions between maintaining an export control regime on the basis of sovereign geographic territory and participating in a global economy that transcends the physical territory of a State.

In this thesis and its case study consider that we live in a globalizing era in which sovereign States remain principal subjects and sources of international law. Reflect on how policy, economic, and techno globalization relate to sovereign control of satellite and space technology and ask the following key questions:

(1) What impact do policy, economic, and techno globalization have on formal and applied sovereign authority?

(2) What impact do policy, economic, and techno globalization have on the effectiveness of space technology export controls? Or more specifically on the U.S. satellite export control regime?

(3) How do these three phenomena relate to each other?

(4) How do they relate to globalization more broadly?

In subsequent Chapters these questions are raised within the context of a U.S. satellite export control regime case study. It is hypothesized that this case study will reveal that the strategic vision upon which the United States has crafted its law and policy has failed to properly consider these three phenomena and their relationship to space technology export control.

PART 2: A Case Study of U.S. Comsat Export Controls– A Regime In Need of Reform?

Part II is a case study of the U.S. commercial communication satellite export control regime. The fundamental question guiding this case study is whether the current regime is in need of reform and if so, why. Towards this end, the U.S. approach to Comsat export controls, the challenge of U.S.-E.U. regulatory divergence, an economic impact assessment in light of strategic effectiveness, a public choice analysis of the failure of reform efforts, and concrete reform proposals are included in this case study. At the end of this case study, "Key Findings" are identified, and when appropriate, generalized to space technology trade and proliferation controls more broadly. Thereafter, these "Key Findings" provides a basis upon which Part III of this thesis transcends the minutia of the case study and elevates its discourse to address the nexus between space trade and proliferation controls and global civil space cooperation in outer space.

Chapter IV

The U.S. Approach to Comsat Export Controls and the Challenge of U.S-E.U. Regulatory Divergence

The narrative of this Chapter explores the U.S. and European approach to Comsat control within the context of regulatory divergence. Unveiled to the reader are the policy rationales associated with U.S. Comsat export control, in particular as they relate to China. At the same time, a study of U.S. and E.U. controls reveals a tension as the U.S. attempts achieve regulatory harmonization with Europe. As will be explored in subsequent Chapters, the difficulty in achieving regulatory harmonization with Europe is a crucial factor in the effectiveness of U.S. Comsat controls.

The Chapter begins with a jurisprudential study of U.S. export control law and policy, focusing on the implementation of Congressional policy in U.S. export license authorization system (Section 1: *An Overview of the U.S. Munitions and Dual-Use Export Control System*). Thereafter, the specifics of U.S. Comsat policy rationale, legislation, and regulation are examined (Section 2: *U.S. Comsat Export Controls*). Finally, the European approach to Comsat export controls are explained (Section 3: *European Comsat Export Controls*) and U.S-E.U. law is compared using a qualitative metric of regulatory divergence (Section 4: *Comparative Analysis of U.S-E.U. Comsat Control*).

A. An Overview of the U.S. Munitions and Dual-Use Export Control System

Organized societal control over goods and technology is an ancient phenomenon. It existed long before the first export controls in the United States. The commonality amongst historical controls and our modern controls is the human need to protect one's interests. Self interest is the driving force of control.

For example, the Byzantine Empire categorized "Greek fire" as a military technological secret, tightly controlled its "know-how," and enforced its controls with criminal sanctions of death.[125] Greek fire was a powerful incendiary weapon that provided a significant advantage in naval battle and the Byzantine Empire held a monopoly on this technology. If the "secret" of this technology had been released, the asymmetric military advantage of Greek fire would be broken. Similarly, in medieval Europe the export of crossbows and Karelian timber were controlled as military and strategic goods.[126] Crossbows were a powerful weapon that served as significant force multipliers and Karelian timber was controlled due to its usefulness in making sailing masts. By controlling their export, European kingdoms achieved strategic advantages by prohibiting the export of a weapon (e.g. Crossbow) and prohibiting the export of a strategic good (e.g. Karelian Timber).

This logic of self-interest and strategic advantage has not been lost by the United States. One of the first acts of the U.S. republic was to control exports. On September 10th, 1775, the 2nd Continental Congress of the United States ordered and subsequently suspended all exports to Britain, Ireland, and the West-Indies.[127] As were all export

[125] *See* R.J. Forbes, "Naphtha Goes To War", in More Studies in Early Petroleum History 1860-1880, (Leiden: E.J. Brill, 1959) at 82. Emperor Constantine Porphyrogenitus declared: "You must of all things spend your care and your attention on the liquid fire…and if they dare ask you for it…you must deny and reject this demand….He declared anathema forever, he declared infamous whoever, emperor, patriarch, prince or subject, who would try to violate this law. He also ordered all men who fear and loved God to treat the malefactor as a public enemy, to condemn him and to deliver him to the cruelest torture." Id. quoting Costantine Porphyrogentius, De Adminisstrando Imperio, Cap. 13. *Cf.* Elizabeth Jefferys, *Byzantine Style, Religion and Civilization*, (Cambridge: Cambridge University Press, 2006) at 290-326.

[126] *See* Ralph Payne-Gallwey, *The Crossbow, Medieval and Modern, Military and Sporting: It's Construction, History, and Management* (London: Holland Press, 1958). *See also* Jackson Slipek, "U.S. Export Controls: Is there a new sheriff in town," online: *SDCExec.Com* (2009) < http://www.sdcexec.com/online/article.jsp?siteSection=13&id=11400&pageNum=1> [Last accessed on October 20, 2009]. *See also*, Bruce Jackson, "An Overview of U.S. Export Controls" (Trade Management and Consulting Group of JP Morgan, August 2008) online: *<www.buyusa.gov/colorado/overview.pdf> [Last accessed on October 20, 2009].*

[127] *See* Worthington Ford, *Journals of the Continental Congress 1774-1779,* (Washington D.C.: Government Printing Office, 1905) at "The Articles of Association, *October 20th, 1774," available online at the Yale Law School Avalon Project <http://avalon.law.yale.edu/18th_century/contcong_10-20-74.asp> [Last accessed on October 20, 2009]*. "The earnest desire we have not to injure our fellow-subjects in Great-Britain, Ireland, or the West-Indies, induces us to suspend a non-exportation, until the tenth day of September, 1775; at which time, if the said acts and parts of acts of the British parliament herein after

controls in the United States until the mid-twentieth century, these measures were instituted and operated only during a period of war.[128] It was not until the *Neutrality Act of 1935* that exports became subject to control during peacetime.

I. Munition Export Controls: The Arms Export Control Act of 1976

In 1935, Congress enacted the first peace-time export controls for the United States. The *Neutrality Act of 1935* prohibited the export of arms, munitions, and implements of war from the United States to any foreign State at war.[129] Its primary policy goal was "to regulate the fast-growing, multibillion-dollar commercial arms export industry."[130] Towards that end, the Neutrality Act required arms manufactures, exporters, and importers to register with the Secretary of State. It prohibited the exportation and/or importation of controlled items without a license issued by the Secretary.[131] It also authorized the President to list articles that shall be considered arms, ammunition, and implements of war, the historical predecessor to the current United States Munitions List (USML).[132]

The Neutrality Act has been amended and replaced several times, but its raison d' etre continues. Today its progeny is the *Arms Export Control Act* (AECA) of 1976, legislation that grants the President the authority to control the export of defense articles and defense services and authorizes the Department of State to license and enforce the export of defense articles and services.[133] As will be discussed subsequently in further detail, many of the regulatory mechanisms established in the *Neutrality Act* still exist in

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mentioned, ate not repealed, we will not directly or indirectly, export any merchandise or commodity whatsoever to Great-Britain, Ireland, or the West-Indies, except rice to Europe."

[128] For an interesting history of U.S. Government export restrictions *See* Harold Berman & John Garson, "U.S. Exports Controls – Past, Present, and Future" 67(5) Colum. L. Rev. 791 (1967) at 791, Fn.1.

[129] *Neutrality Act*, 22 U.S.C. 441, 49 Stat. 1081 (1935).

[130] John Heinz, *U.S. Strategic Trade: An Export Control Systems for the 1990s,* (Oxford: Westword Press, 1991) at 8. *See Neutrality Act*, 22 U.S.C. 441, 49 Stat. 1081 (1935).

[131] *Neutrality Act*, 22 U.S.C. 441, 49 Stat. 1081 (1935).

[132] *Neutrality Act*, 22 U.S.C. 441, 49 Stat. 1081 (1935).

[133] The *Arms Export Controls Act of 1976,* 22 U.S.C. §2778 et al. (2009).

the *Arms Export Control Act*. The *Arms Export Controls Act of 1976* (AECA) grants the President the authority to control the export of defense articles and defense services.[134] The policy goals of the AECA are to further world peace and the security and foreign policy of the United States.[135] The President is authorized to designative those items which are considered as defense articles and services on a list known as the United States Munitions List (USML).[136] Regulations promulgated under the AECA are known as the International Trafficking in Arms Regulations (ITAR).[137] These regulations are administered by the Directorate of Defense Trade Controls (DDTC).

II. Commercial Export Controls: The Export Administration Act of 1979

On July 2nd, 1940, Congress enacted *An Act to Expedite the Strengthening of the National Defense* (i.e. *Export Control Act of 1940*). This Act was the first legislation in the United States to control, during peacetime, commercial products and material of military significance.[138] These controls were premised on a policy rational of "national defense." The President of the United States was granted authority to prohibit or curtail the export "of military equipment or munitions or component parts thereof, or machinery, tools, or material, or supplies necessary for the manufacture, servicing, or operation

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[134] 22 U.S.C. §2778(a) (2009).

[135] 22 U.S.C. §2778(a) (2009).

[136] In the EAA and AECA the President has been delegated the authority to designate those items that are on either the Commerce Control List (CCL) or the United States Munitions List (USML). The Department of Commerce and Department of State are administrative organs that periodically assess and reform these lists. Constitutionally, the President is granted a wide array of discretion of list item determination. *See Butterfield v. Stranahan,* 192 U.S. 470; 24 S. Ct. 349 (1904). Under the AECA there is no judicial review of designation of items as defense articles or services. *See* 22 U.S.C. §2778(h) (2009). Under the EAA judicial review of CCL items is proscribed. *See* 50 U.S.C. 2412(a) (2009).

[137] 22 U.S.C. §2778(a) (2009).

[138] Panel on the Impact of National Security Controls on International Technology Transfer, *Balancing the National Interest: U.S. National Security Export Control and Global Economic Competition*, (Washington D.C.: National Academy Press, 1987) at 71. "Under the provisions of the Neutrality Acts of 1935-1939, exports of goods with potential military application such as advanced aircraft and parts did require a license from the State Department. But State could not withhold such licenses until the President invoked the full provisions of the act and embargoed all such exports to both parties in the war in question – an action he consistently resisted. In particular the Roosevelt administration opposed efforts to apply this act to the Sino-Japanese conflict in 1937 because it would have hurt China far more than Japan." *Id.* at 71, footnote 4.

thereof..." *only if* the President determined that it is necessary in the interest of national defense.[139]

When the *Export Control Act of 1940* was enacted, Congressional intent was for export control authority to be limited to the extent necessary to ensure supply of materials for the U.S. national defense program.[140] However, President Franklin D. Roosevelt exercised his authority under this Act to achieve *foreign policy objectives* well beyond this limited conception of "national defense". For example, in 1940 Roosevelt prohibited the export of petroleum, petroleum products, and scrap metal from the United States without a specific license, effectively embargoing strategic material exports to Japan to achieve the foreign policy objective of hindering Japan's war fighting capability.[141] It was not until 1949 that foreign policy objectives in the interests of U.S. national security were enumerated as an appropriate rationale.[142]

After World War II the United States implemented a series of control measures on items other than munitions and atomic energy materials predicated on the rationale that materials of potential military significance should not be exported to the Soviet bloc.[143] These Post-WWII controls on "non-military" goods are the origins of export control as an instrument of "national security" and the modern conception of "dual-use goods."

Given the use of export controls for foreign policy objectives consistent with U.S. national security in the aftermath of World War II and the need to control commercial

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[139] *Export Control Act,* 54 Stat. 714, §6 Public Law 703 (2 July, 1940).

[140] *See Export Control Act,* 54 Stat. 714, §6 Public Law 703 (2 July, 1940). "Be it enacted…that ir order to expedite the building up of the national defense…" *Id. Also see* "Key Materials Put under Export Ban" *The N.Y. Times* (3 July, 1940) Special to the *N.Y. Times* page 1.

[141] *See* John Chider, "Ban Affects Japan: U.S. Supply of Materials to Her War on China Can be Cut Off" *N.Y. Times* (26 July, 1940) Special to the *N.Y. Times* page 1. "While no final conclusions as to political implications of the action would be warranted until it is observed how the government intends to exercise its remaining power, the mere act of subjecting exports of products so important to Japan to a control system was regarded as a definitive step in the application of a vigorous economic policy toward Japan." *Id.*

[142] *See Export Control Act of 1949,* 63 Stat. 7, §2 Public Law 11 (26 February, 1949).

[143] *See* Walter Surrey and Crawford Shaw "Excerpt from a lawyer's Guide to International Business Transactions," (1963) in Stanley Metzger ed., *Law of International Trade: Documents and Readings,* (Washington D.C.: Learner Law Book Company, 1966) at 1051.

items of potential military significance, Congress enacted the *Export Control Act of 1949*. This act established U.S. policy objectives for export controls over "any articles, materials, or supplies, including technical data" to the extent necessary:

> (a) to protect the domestic economy of the United States from the excessive drain of scarce materials and to reduce the inflationary impact of abnormal foreign demand (i.e. short supply);
>
> (b) to further the foreign policy of the United States and to aid in fulfilling its international responsibilities (i.e. foreign policy); and
>
> (c) to exercise the necessary vigilance over exports from the standpoint of their significance to the national security (i.e. national security).[144]

The *Export Control Act of 1949* expanded upon earlier legislation in four critical ways. First, the policy bases upon which the President could exercise authority and jurisdiction over export controls was expanded to explicitly include foreign policy and national security. Second, controls over dual-use items (items other than munitions and atomic energy materials that are of potential military significance) during peacetime were established. Third, controls were extended to technical data. Fourth, the broad reach of "any articles, material, or supplies" meant that export controls were applicable to almost all exports.

Today, the *Export Administration Act of 1979* (EAA) establishes U.S. export controls for dual-use items.[145] The EAA maintains earlier Congressional policies of export control for short supply, foreign policy, and national security.[146] But, in addition, the EAA recognizes economic security as a policy priority and broadens export control

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[144] *Export Control Act of 1949,* 63 Stat. 7, §2 Public Law 11 (26 February, 1949).

[145] It should be noted that the EAA contains a termination date that is periodically extended. The last extension expired in August 2001. Since this expiration, the export licensing system created under the authority of the EAA has continued by Presidential invocation of the International Emergency Economics Powers Act (IEEPA). *See* 50 U.S.C. §2419 (2009)..

[146] *Export Administration Act,* 50 U.S.C. §2402 et seq. (2009).

policy beyond military and foreign security.[147] Specifically, export controls are only to be used "after full consideration of the impact on the economy of the United States" and "to use its economic resources and trade potential to further the sound growth and stability of its economy."[148]

This evolution of Congressional policy to include economic security concerns began during the 1960s as the rationale for strict controls on American trade with European Communist States became less compelling.[149] Under the EAA, the Secretary of Commerce is authorized to promulgate regulations to control the export of goods and technology. These regulations are the Export Administration Regulations (EAR). Towards this end the Secretary of Commerce also maintains a Commerce Control List (CCL) that states licensing requirements for the export of goods and technology under the Act.[150] The EAR is administered by the Bureau of Industry and Security (BIS).

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[147] The EAA adopts a policy to minimize uncertainties in export control policy, encourage international trade, and to fully consider the impact of export controls on the impact of the U.S. economy.

[148] 50 U.S.C. §2402(a)(2) & §2402(a)(3)(2009).

[149] *See* Kenneth Abbott, "Linking Trade to Political Goals: Foreign Policy Export Controls in the 1970s and 1980s" 65 Minn. L. Rev. 739 (1981) at 757. *Also see* Harold Berman & John Garson, "U.S. Exports Controls – Past, Present, and Future" 67(5) Colum. L. Rev. 791 (1967).

[150] *See* 50 U.S.C. §2402(c) (2009).

Flow Chart Diagram of the U.S. Control System for Munition and Dual-Use Exports


[151]

III. Comparative analysis of ITAR and EAR Regulations

The most important difference between the AECA's International Trafficking in Arms Regulations (ITAR) and the EAA's Export Administration Regulations (EAR) is that EAR controls goods and technologies generally, with special consideration given to the domestic economic impact of export controls, while ITAR controls defense articles and services. These differences are reflected in the respective licensing regulatory mechanisms including inherent presumptions regarding an applicant's right to export, license application requirements,[152] interagency review and Congressional notification

[151] Created by Michael C. Mineiro. Based on chart in "Introduction to U.S. Export Controls for the Commercial Space Industry," Department of Commerce Publication, October (2008), available online at <http://www.faa.gov/about/office_org/headquarters_offices/ast/media/Intro%20to%20US%20Export%20Controls.pdf> (Last Accessed November 17th, 2009).

[152] *See generally* ITAR 22 C.F.R. §120 et seq. (2009) & EAR 15 C.F.R. §730 et seq. (2009).

processes,[153] de-minims context, foreign availability and other licensing exceptions,[154] costs associated with licensing and compliance,[155] and the severity of civil and criminal penalties in the event of a violation.[156]

ITAR v. EAR LICENSING COMPARISON TABLE

ITAR	EAR
ITAR authorization legislation is based upon Congressional findings that the international arms trade needs to be regulated	EAR authorization legislation is based upon Congressional findings that short supply, foreign policy, and national security mandates the regulations of commercial goods exports
Controls defense articles and services (e.g. items and services that are inherently of a military nature; arms & munitions) including related Technical Data and Technical Assistance	Controls commercial and "dual-use" goods and technology (e.g. goods sold for commercial purposes that would make a significant contribution to the military potential of another country, a contribution which could prove detrimental to the national security of the United States)
Strict regulatory regime whose policy is solely to ensure the national security interests of the United States; economic growth and foreign trade is not a policy objective.	National security is only one policy consideration of this regulatory regime; economic growth and foreign trade are also policy objectives
Foreign Policy and Destination/End-User Controls	Foreign Policy and Destination/End-User Controls
Recognizes and implements International Export & Proliferation Control Agreements & Arrangements	Recognizes and implements International Export & Proliferation Control Agreements & Arrangements

[153]*See* 22 U.S.C. §2776 & §2778 et seq. (2009). *See also* §1512 of the Thurmond Act, Pub. L. 105-261 (1999).

[154] *See* 50 U.S.C. §2403(c) (2009).

[155]*See* EAA 50 U.S.C. 2403(g) (2009): "no fees may be charged in connection with the submission or processing of an export license application." *Compare* this to the AECA/ITAR in which the government has exporters self-finance DDTC licensing requirements. *See* 73 Federal Register 55349 (amending ITAR § 122.2, 122.3, and 129.4).

[156] *See* Criminal sanctions under the AECA, 22 U.S.C. §2778(c): "fined for each violation not more than $1,000,000 or imprisoned not more than ten years, or both." *See* civil sanctions under the AECA, 22 U.S.C. §2778(e): "Civil penalty for each violation involving controls imposed on the export of defense articles and defense services may not exceed $500,000." *Compare* this to the EAA 50 U.S.C. §2410(b) (2009): for willful violations individuals shall be "fined not more than $250,000, or imprisoned not more than 10 years, or both" and except in the case of individuals "shall be fined not more than five times the value of the exports involved of $1,000,000, whichever is greater."

Limited licensing exceptions.	Licensing exceptions include foreign availability & de minimis value.
Fees for licensing.	No fees for licensing.

Within the EAR system there is a "presumption of approval" for export license applicants.[157] The majority of exports licensed within the EAR are granted general licenses (EAR-99 licenses) that require only minimum documentation and disclosure by the exporter at the time of export.[158] In instances when the BIS have identified a particular item and/or country of destination for which a validated export license is required, various licensing exemptions exist for which a licensee applicant may be eligible. These include de minimis content, shipments of limited value (SLV), civil-end users (CIV), temporary exports, imports, and re-exports (TMP), and servicing and replacement parts and equipment (RPL).[159] Note however that certain space qualified items are specifically excluded from EAR 740 licensing exceptions.[160] Compare this to the ITAR system in which there is a "presumption of denial" for export license applicants.[161] ITAR exporters must prove that their item or service does not pose significant risk to national security.[162] The only major ITAR licensing exemption is the *public domain* exception (which encompasses the fundamental research exception).[163]

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[157] *See* EAA 50 U.S.C. §2403(d) (2009):"No authority or permission to export may be required under this Act or under regulations issued under this Act, except to carry out the policies set forth in section 3 of this Act." *Also see* "Introduction to U.S. Export Controls for the Commercial Space Industry," Department of Commerce Publication, October (2008), available online at <http://www.faa.gov/about/office_org/headquarters_offices/ast/media/Intro%20to%20US%20Export%20Controls.pdf> (Last Accessed November 17th, 2009) at pg.3.

[158] EAR99 is a general category of goods and technology that encompasses many widely traded consumer and industrial items.

[159] *See* 50 U.S.C. §2404(a)(5)(2009). *See also* EAR 15 C.F.R. §740 et seq. (2009).

[160] EAR 15 C.F.R. §740.2(7) (2009).

[161] *See* "Introduction to U.S. Export Controls for the Commercial Space Industry," Department of Commerce Publication, October (2008), available online at <http://www.faa.gov/about/office_org/headquarters_offices/ast/media/Intro%20to%20US%20Export%20Controls.pdf> (Last Accessed November 17th, 2009) at pg.3.

[162] *See* "Introduction to U.S. Export Controls for the Commercial Space Industry," Department of Commerce Publication, October (2008), available online at

In instances when validated licenses are required under the EAR for national security purposes (as opposed to foreign policy or short supply), the controlled exports are considered "critical technologies to military use."[164] This is distinguished from ITAR items which are all deemed as "defense articles and services" and in some instances elevated to the status of "significant military equipment."[165] As the ambiguity of this language indicates, it can be a blurred line between "dual-use" and "military-use" technologies.

The EAR controls goods and technology that are on the CCL. Goods are defined as "any article, natural or manmade substance, material, supply or manufactured product, including inspection and test equipment, and excluding technical data."[166] Technology is "the information and know-how (whether in tangible form, such as models, prototypes, drawings, sketches, diagrams, blueprints, or manuals, or intangible form, such as training or technical services) that can be used to design, produce, manufacture, utilize, or reconstruct goods, including computer software and technological data, but not the goods themselves."[167]

ITAR controls defense articles and services listed on the USML. "Defense articles" are:

I. Any weapon, weapons system, munition, aircraft, vessel, boat, or other implement of war,
II. Any property, installation, commodity, material, equipment, supply, or goods used for the purposes of making military sales,

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<http://www.faa.gov/about/office_org/headquarters_offices/ast/media/Intro%20to%20US%20Export%20Controls.pdf> (Last Accessed November 17th, 2009) at pg.3.

[163] *See* ITAR 22 C.F.R. §120.10 & 120.11 (2009). *But See* other ITAR provisions in which there are special exemptions for NATO/Allied countries and other unique circumstances.

[164] *See* 50 U.S.C. §2403(a)(3) & 2404(d) (2009).

[165] *See* 22 U.S.C. §2794 (2009).

[166] 50 U.S.C. §2415(3) (2009).

[167] 50 U.S.C. §2415(4) (2009).

III. Any machinery, facility, tool, material, supply or other item necessary for the manufacture, production, processing, repair, servicing, storage, construction, transportation, operation, or use of any article listed in this paragraph,

IV. Any component or part of any article listed [on the USML]…[168]

A defense article also includes its associated technical data.[169] Technical data is:

I. Information which is required for the design, development, production, manufacture, assembly, operation, repair, testing, maintenance or modification of defense articles. This includes information in the form of blueprints, drawings, photographs, plans, instructions or documentation;

II. Classified information relating to defense articles and defense services;

III. Information covered by an invention secrecy order; or,

IV. Software directly related to defense articles.

A defense service "includes any service, test, inspection, repair, training, publication, technical or other assistance, or defense information (as defined in §2403(e) of this Title), used for the purposes of making military sales, but does not include design and construction services under §2769 of this title."[170] Defense information "includes any document , writing, sketch, photograph, plan, model, specification, design, prototype, or other recorded or oral information relating to any defense article of defense service, but shall not include Restricted Data as defined by the Atomic Energy Act of 1954, as amended [42 U.S.C. 2011 et esq.]…"[171]

Both the EAA and AECA have foreign policy controls for a variety of purposes, including: anti-terrorism, regional stability, crime control, UN sanctions, unilateral embargoes and sanctions, and non-proliferation. Control lists of specific destinations, person, or entities are used in conjunction with the CCL and USML to determine export

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[168] 22 U.S.C. §2794(3) (2009).

[169] ITAR 22 C.F.R. §120.6 (2009).

[170] 22 U.S.C. §2794(4) (2009).

[171] 22 U.S.C. §2403(e) (2009).

restrictions and licensing conditions. Controls maintained in cooperation with other States are implemented within the EAR and ITAR and both the DOS and DOC have administrative jurisdiction to ensure exports are compliant with US international agreements and arrangements.

During the licensing process an interagency review may be undertaken. Under ITAR, any license application submitted to the DOS may be reviewed by the DOD[172], but the Commerce Dept is not involved in the review of license applications.[173] DOS has an informal veto on license applications on foreign policy and national security grounds; however, State and Defense tend to defer to one another and appeals are extremely rare.[174] By contrast, in the DOC licensing application, none of the participating departments or agencies (Commerce, State, Defense, Energy, and the Arms Control and Disarmament Agency) has a veto over license applications. A majority vote determines the outcome at the Advisory Committee level and Review Board level.[175]

In the event a license applicant needs clarification on whether or not the Department of Commerce or the Department of State has export control jurisdiction, the applicant can request a determination called a "commodity jurisdiction request" (CJR).[176] Most often commodity jurisdiction requests are made with the Department of State because ITAR is broadly interpreted "to cover any product that has been designed, designated, developed, configured or adapted for military application" and exporters need clarification as to whether their products are covered under ITAR as defense articles or under the EAR as dual-use or commercial items.[177] CJRs are of limited use in combating

[172] *Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China [Cox Report],* (U.S. Congress, Washington D.C.: 1999) Ch.9 pg. 39.

[173] *Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China [Cox Report],* (U.S. Congress, Washington D.C.: 1999) Ch.9 pg. 40.

[174] *Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China [Cox Report],* (U.S. Congress, Washington D.C.: 1999) Ch.9 pg. 40.

[175] *Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China [Cox Report],* (U.S. Congress, Washington D.C.: 1999) Ch.9 pg. 40.

[176] *See* ITAR 22 C.F.R. §120.3 & 120.4 (2009). *See also* EAR 15 C.F.R. §770.2 (2009).

[177] United States Munitions List, Category 11 ("Military and Space Electronics") (2009).

ambiguities within the USML and CCL. This is because CJRs are fact specific, are not published, and are not 'binding' legal precedent on the respective agencies. As a result CJRs are only useful on a case-by-case basis.

The implementation language of "export" varies in the respective regulatory regimes. For example, the EAR defines "export" as an actual shipment or transmission of items subject to the EAR outside of the United States or the release of technology or software subject to the EAR in a foreign country.[178] ITAR defines "export" as the sending to taking of a defense article (e.g. an item subject to ITAR) outside of the United States *or* the performance of a defense service (whether or not in the United States) *or* the disclosure or transference of technical data to a foreign person (whether or not in the United States).[179]

Both the EAR and ITAR cover 'deemed exports' and 're-exports.'[180] A deemed export under the EAR is "any release of technology or source code subject to the EAR to a foreign national" in the United States.[181] A deemed export under ITAR covers the discourse or transference of any defense article or defense service (including technical data) to a foreign person in the United States. Notice that while the EAR does not deem the release of a *good* to a foreign national in the United States as an export, the ITAR does deem the release of a *defense article* (e.g. good) to a foreign person in the U.S. as an export. ITAR also includes the transference of registration, control or ownership of any aircraft, vessel, or *satellite* covered by the USML as a deemed export.[182] Re-exports are covered under both the EAR and ITAR.[183] Permanent residents of the United States are excluded from the definition of foreign persons under the EAR and ITAR.[184]

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[178] 15 C.F.R. §734.2(b) (2009).

[179] 22 C.F.R. §120.17 (2009).

[180] 22 C.F.R. §120 et seq. (2009);15 C.F.R. §734.2(b) (2009).

[181] 15 C.F.R. §734.2(b) (2009).

[182] 22 C.F.R. §120.17 (2009).

[183] 22 C.F.R. §120.19 (2009); 15 C.F.R. §734.2(b) (2009).

[184] 22 C.F.R. §120.16 (2009);15 C.F.R. §734.2(b) (2009).

Two important licensing exceptions granted within the EAR that are not granted under ITAR are the de minimis content and foreign availability exceptions. As a general rule, the EAR de minimis content rule provides that the reexport, anywhere in the world, of a foreign made commodity incorporating U.S.-origin commodities or 'bundled' with U.S-origin software valued at 10% or less of the total value of the foreign-made commodity is not subject to the EAR.[185] A foreign made commodity incorporating U.S.-origin commodities or 'bundled' with U.S.-origin software valued at 25% or less of the total value of the foreign-made commodity can be reexported to select countries (Group Category E:1) is not subject to the EAR.[186] The de minimis content exception does not apply to certain items and/or to particular destinations and/or persons. "[The Department of] State has nothing like Commerce's *de minimis* rule that determines whether U.S. control of foreign-origin items is appropriate based on the percentage of U.S. content. Rather, the Department of State controls technology using a "look-through" policy: if another country wants to sell a controlled "defense article" (e.g. a satellite) with U.S. parts, it will need U.S. approval.[187]

AECA imposes no policy requirement to take into account foreign availability of controlled articles and services when determining whether or not an item should be listed on the USML. "This is because independent of whether foreigners can sell an item, the U.S. Government may wish to preserve a technology lead, or would not want certain countries to obtain the military technology from the United States."[188] Also, the intended use of an item is not relevant. According to the regulations:

> *The intended use of the article or service after its export (i.e., for a military or civilian purpose) is not relevant in*

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[185] 15 C.F.R. §734.4(b) (2009).

[186] 15 C.F.R. §734.4 (2009).

[187] *Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China [Cox Report],* (U.S. Congress, Washington D.C.: 1999) Ch.9 pg. 44.

[188] *Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China [Cox Report],* (U.S. Congress, Washington D.C.: 1999) Ch.9 pg. 59.

determining whether the article or service is subject to the [International Traffic in Arms Regulations] controls. . .”[189]

Compare this to the EAA, which does require the Secretary of Commerce to consider the availability of any goods or technology from sources outside the United States.[190] “For dual-use items covered by the Export Administration Regulations, the foreign availability of a commodity can be the basis for removing export controls on that commodity. It cannot, however, override national security."[191]

IV. Constitutionality

In the United States there is no constitutional right for individuals to engage in international trade and commerce. Congress can, without violating due process, establish standards and provide for considerations of public policy to control, limit, or prohibit exports and imports.[192] The only limitation to this authority is a Constitutional prohibition against Congressional authority to tax any goods or services in export transit.[193]

Due process is not violated if judicial review is prescribed for USML/CCL list and commodity jurisdiction determinations. The rationale is that the determination of technology that endangers U.S. national security is a political question for Congress and the Executive and is not within the purview of the Judiciary.[194] First Amendment rights to speech with regards to export controls on computer code have been ruled as

[189] 22 C.F.R. §121 (2009).

[190] 22 U.S.C. §2404(f) et seq. (2009).

[191] *Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People’s Republic of China [Cox Report],* (U.S. Congress, Washington D.C.: 1999) Ch.9 pg. 41.

[192] *See Butterfield v. Stranahan,* 192 U.S. 470; 24 S. Ct. 349 (1904).

[193] Article 1, Section 9, of the *U.S. Constitution.*

[194] *See United States v. Spawr Opticial Research, Inc.,* 864 F.2d 1467 (9th Cir. 1988), *cert. denied*, 493 U.S. 809, 107 L Ed. 2d 20, 110 S. Ct. 51 (1989). *See Karn v Macnamara,* 925 F. Supp. 1 (1996).

constitutional so long as the export controls are content neutral and meet criteria established in *U.S. v. O'Brien* (the so called O'Brien test).[195]

V. Judicial Review

Judicial review of executive action is highly prescribed under the AECA and EAA. The AECA precludes judicial review of the designation of items as USML defense articles or services and of commodity jurisdiction decisions.[196] Similarly, the EAA also precludes judicial review of goods and technologies to the CCL and of commodity jurisdiction decisions.[197] The decision to include an item on the USML or CCL, as well as commodity jurisdiction requests is only appealable through the respective executive agencies. Judicial review is available where the plaintiff alleges that the agency facially violated its authority delegated under the statute.[198] The EAA does grant the right to appeal the denial of an export license application and judicial review if the processing of the application is not completed within the time frame specified within the EAA.[199] This is a marked difference from the AECA which does not impose a limit to the time in which the Office of Defense Trade Controls (ODTC) must make a licensing decision.[200]

B. U.S. Comsat Export Controls

In the United States, unless nuclear materials are involved, commercial communication satellites (Comsats) and their associated equipment (SQUIPE) are subject

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[195] *See Karn v Macnamara,* 925 F. Supp. 1 (1996). *See also U.S. v. O'Brien,* 391 U.S. 367, 20 L. Ed. 2d 672, 88 S. Ct. 1673 (1968). In addition to a government regulation being "content neutral", it must also be (1) within the constitutional power of the government, (2) furthers an important government interests, and (3) is narrowly tailored to the government interest.

[196] *See Karn v Macnamara,* 925 F. Supp. 1 (1996). *See also* §2778(h)

[197] *See United States v. Spawr Opticial Research, Inc.,* 864 F.2d 1467 (9th Cir. 1988), *cert. denied*, 493 U.S. 809, 107 L Ed. 2d 20, 110 S. Ct. 51 (1989). *See also* 50 U.S.C. 2412(a) (2009).

[198] *See Dart v. U.S.* , 270 U.S. App. D.C. 160, 848 F.2d 217, 223 (D.C. Cir. 1988).

[199] 50 U.S.C. §2409(j) (2009).

[200] Rachel Claus, "Space-Based Fundamental Research and the ITAR: A Study in Vagueness, Overbreadth, and Prior Restraint" 2 Santa Clara Journal of International Law 1 (2003).

to the export controls of either the AECA or EAA. As discussed infra, the AECA establishes a regulatory regime named ITAR to control the export of commercial goods, services, and technologies categorized as munitions while the EAA establishes a regulatory regime named EAR to control the export of commercial goods, services, and technologies categorized as commercial dual-use.

The United States has gone through three distinct eras of commercial communication satellite export controls. In the first era (begun during the Cold-War and lasting until the early 1990s), Comsats were primary controlled as munitions and subject to ITAR. In the second era (1991-1999) the United States liberalized its export controls on Comsats, granting the Commerce Department greater jurisdiction over export controls. The third era, which continues today, began with the passage of the Strom Thurmond Defense Appropriations Act of 1999 and is a reversion to ITAR based Cold-War era export control policy. Understand that these three regulatory areas bleed over into each other; there is ambiguity in the transitions between these eras. This is particularly true with regards to the late 1980s and early 1990s, as the U.S. shifted from a Cold-War munitions paradigm of commercial satellite activity, to a more dual-use commercial department oriented paradigm by the mid-1990s.

<u>Commercial Satellite Exports: U.S. Regulatory Eras [Diagram]</u>

In the early days of the Cold-War, satellites and space launch vehicles were developed for national security and military needs. Virtually no technology was subject to commercial export controls because there was no commercial space market. It was not until the launch of the Early Bird Communication Satellite in 1965 that a commercial space application was developed. Since Early Bird, the telecommunication satellite industry has been the primary commercial economic actor in outer space.

During the late 1960s and into the 1970s, space-based commercial telecommunications grew exponentially. U.S. satellite manufacturers, heavily bankrolled by the Federal Government under U.S. military contracts, had the technology and capital infrastructure to dominate the market. Stringent export controls prevented technology proliferation and U.S. satellite technology was categorized as munitions. U.S. foreign policy sought, and to a great extent achieved, policy coordination with other Western States on the export control of satellites via the COCOM Committee.[201] At the same time, a U.S. government monopolized launch services industry virtually assured all Western satellites would be launched in the United States, the practical result being that no U.S. satellites would be exported for launch services.

However, the commercial space environment began to change in the early 1980s. Western Europe, as a commercial space player, stared to come into being. European States developed indigenous satellite technology for commercial export. *Arianespace,* the world's first commercial launch service provider, was established by France.[202] Europe was developing as an economic competitor and, as a consequence, the United States was no longer able to monopolize international satellite sales and launches. It became harder for the United States to achieve export control policy coordination within COCOM on satellite export controls as U.S. and European respective interests diverged.[203]

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[201] *See* Richard Cupitt & Suzette Grillot, "COCOM is Dead, Long Live COCOM: Persistence and Change in Multilateral Security Institutions" 27 B.J. Pol. S. 361 (1997). *See also* Joan Johnson-Freese, "Alice in Licenseland: U.S. Satellite Export Control since 1990" 16 Space Policy 195 (2000). *See also*, Michael Mastanduno, *Economic Containment: COCOM and the Politics of East-West Trade* (Cornell University Press: 1992).

[202] *See* Klaus Iserland, "Ten Years of Arianespace" (1990) 6(4) Space Policy 341.

[203] *See* Richard Cupitt & Suzette Grillot, "COCOM is Dead, Long Live COCOM: Persistence and Change in Multilateral Security Institutions" 27 B.J. Pol. S. 361 (1997). *See also* Joan Johnson-Freese, "Alice in Licenseland: U.S. Satellite Export Control since 1990" 16 Space Policy 195 (2000). *See also*, Michael Mastanduno, *Economic Containment: COCOM and the Politics of East-West Trade* (Cornell University Press: 1992).

This combination of more States participating in a growing international marketplace for Comsats and an increase in the number of international launch service providers resulted in augmented international trade in the field of satellites and satellite launch services.[204] A major shift in U.S. space policy after the 1986 Challenger disaster further accelerated the commercialization of satellite exports, as the U.S. official policy shifted from U.S. government sponsored launches to private commercial launches.[205]

By the time the Soviet Union had collapsed (in the early 1990s), COCOM coordination of commercial communication satellite export controls was deemed unsustainable. The Post-Cold War opened up the possibility of increased trade without the issue of political ideology. Europe and the United States reassessed their international export control commitments with the termination of COCOM and the establishment of the Wassenaar Arrangement.[206] China and Russia entered into bilateral technology safeguards and launch service agreements with the United States, opening up Chinese and Russian launch service providers to satellite owner/operators with indigenous U.S. technology.[207] Domestically, both U.S. and European export controls shifted away from a more stringent "munition" type controls to more commercial "dual-use" standards.

In the United States, a policy of satellite export control liberalization resulted in the Commerce Department receiving more regulatory authority over satellites and associated equipment. Typical commercial communication satellites were licensed under

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[204] *See* U.S., Federal Aviation Administration, *2009 Commercial Space Transportation Forecasts*, (Washington D.C.,: 2009), available online at: <http://www.faa.gov/about/office_org/headquarters_offices/ast/media/NGSO%20GSO%20Forecast%20June%203%202009%20lowres.pdf>.

[205] *See U.S. Presidential Directive on National Space Policy* (February 11th, 1988), available online at: < http://www.hq.nasa.gov/office/pao/History/policy88.html>.

[206] *See* Richard Cupitt & Suzette Grillot, "COCOM is Dead, Long Live COCOM: Persistence and Change in Multilateral Security Institutions" 27 B.J. Pol. S. 361 (1997). *See also* Joan Johnson-Freese, "Alice in Licenseland: U.S. Satellite Export Control since 1990" 16 Space Policy 195 (2000).

[207] *See China-U.S. Agreements of Satellite Technology Safeguards* (1988, 1993, 1995). *See China-U.S. Agreements on International Trade in Commercial Launch Services* (1989, 1995). *See Russia-U.S. Agreements of Satellite Technology Safeguards* (1993, 1999). *See Russia-U.S. Agreements on International Trade in Commercial Launch Services* (1993).

the Export Administration Regulations, as opposed to the International Trafficking in Arms Regulations. U.S. satellites were exported for launch on Chinese launch vehicles. This second era of control liberalization continued until 1999, when the findings of the Cox Commission and associated legislation (*Strom Thurmond Defense Act of 1999*) returned the United States to a Cold-War categorization of commercial communication satellites as munitions and put the proverbial genie back in the bottle.

Defining Characteristics of Comsat Regulatory Eras [Table]

	Cold-War Era	**Post-Cold War Era**	**Thurmond Era**
Time Frame	Era began in 1949 and terminates during a transition period from the mid-1980s to the early 1990s.	Era began in the mid-to-late 1980s and continued until 1999.	Era began with the passage of the Strom Thurmond Defense Act of 1999 and continues to this day
ITAR v. EAR Categorization	U.S. export controls on commercial communication satellites predominately categorized as ITAR	Liberalization of U.S. domestic export controls on commercial satellites (in particular communication satellites) as evidenced by increased categorization of commercial satellites as "dual-use" goods subject to the EAR	Practically all satellites and associated technology Congressionally mandated to be categorized at ITAR
International Policy Coordination & Divergence	Early era policy convergence amongst COCOM member states on satellite export controls; however increasing policy divergence amongst COCOM	COCOM is terminated and is replaced with the Wassenaar Agreement; both Europe and the United States adopt liberalized commercial export	Serious policy divergence between the United States and E.U.; E.U. Member States generally regulate commercial communication satellites as a "dual-

	members by the 1980s	controls; Policy convergence between United States and Europe on most export control issues related to commercial communication satellites	use" good under significantly less stringent export controls; E.U. Member States and are exporting satellites to China; the United States essentially boycotts U.S. satellite technologies for launch or sale to China
International Commercial Market	International market development for commercial space goods and service (in particular communication satellites) resulting in increased demands for satellites and launch services	Increased U.S. commercial satellite sales to China for operation and launch; increased demand for communication satellites and launch services	China is a launch service provider with significantly lower than market rates; Europe seeks to divest itself of U.S. export controls in order to gain access to Chinese launch services; China and India enter the commercial communication satellite primary manufacturing market
Proliferation Characteristics	Technology proliferation marked by increased competition in the commercial satellite industry and launch services industry	United States and Europe are the technological leaders; indigenous development of commercial satellites and launch vehicles in China	Europe is developing indigenous satellite technology to divest itself of U.S. export controls; China and India are developing indigenous satellite and launch vehicle technology
Dominant Comsat Manufacturing	United States & France	United States, European Union	United States, E.U. (in particular

States		Members States (in particular France)	France), China
States with Commercial Launch Services	France	France, United States, China, and Russia	France, United States, China, Russia, and India

I. China, the Cox Commission & the Thurmond Defense Act of 1999

China is the pivotal key to understanding the law and policy decisions of the United States. The narrative of export control liberalization during the 1990s and the subsequent reversion to strict ITAR controls is not complete without addressing the role of China.

In the area of commercial communication satellites, the U.S. relationship with China was built upon two fundamental economic truths. First, China represented a burgeoning market for U.S. primary satellite manufacturers. Second, China's subsidized commercial launch services offered a significant cost advantage to U.S. satellite manufacturers.

To illustrate, first consider China as a burgeoning market. It is estimated that China's Gross Domestic Product (GDP) has increased ten-fold since 1978.[208] This increase in GDP has led to higher standards of living which in turn have led to greater use and demand for space-based telecommunication services. Such demand requires more satellite based transponders and hence more satellites. During the 1980s and 1990s, U.S. manufacturers eager to get a piece of the Chinese pie actively solicited and competed for Chinese business. The market for commercial communication satellites is relatively small with approximately twenty units contracted yearly.[209] These units range from large GEO

[208] *See CIA World Fact Book: China* (2010), published online at <https://www.cia.gov/library/publications/the-world-factbook/geos/ch.html>.

[209] *See* Ryan Zelnio, "Whose Jurisdiction over the U.S. commercial satellite industry?" 23(4) Space Policy 221 (2007) at 227. ""Typically, 20-30 Comsat contracts are awarded worth $100-$300 million apiece and of these, 15-25 are fiercely competed over in a given year, the remaining are typically captured by sister companies." *See* Futron Corporation White Paper, *How Many Satellites Are Enough? A Forecast of Demand for Satellites 2004-2012* (Bethesda, MD: 2004), published online at <http://www.futron.com/pdf/resource_center/white_papers/Satellite_Forecast_2004_-

telecommunication satellites to smaller MEO or LEO constellation satellites. In an international market in which only a handful of sales are made each year, Chinese market share is invaluable.

The export of Comsats to China is also associated with the launch of satellites from China. This is the often-missed economic part of the export control puzzle. China offers commercial communication launch services at prices discounted from the U.S., Russian, and European rates.[210] The discounted Chinese launch rates provide an economic incentive for U.S. and European manufactures to launch in China. Since lower launch rates can be passed on to the satellite purchasers, satellite manufacturers are able to offer more competitive sale pricing. As a result, manufacturers with access to cheaper launch capacity have a competitive advantage.

It was these two economic incentives that led to successful lobbying efforts by U.S. satellite manufactures for the negotiation and adoption of bilateral agreements that would open-up the Chinese satellite and launch services markets. In 1988, the United States and China entered into two bilateral agreements: one on satellite technology safeguard agreements and the other on launch trade.[211] These agreements both protected against the unauthorized transfer of U.S. satellite technology exported to China for launch[212] and placed limitations on Chinese launching capacity and pricing within the

_2012_White_Paper.pdf>. Quantitative data from 2000 to 2004 establishes an average of only 19 commercial communication satellites launched yearly. Assuming a direct correlation to the number of launches to number of units sold than the average number is approximately nineteen.

[210] *See* Bill Lai, "National Subsidies in the International Commercial Launch Market" 9(1) Space Policy 17 (1993). *See also* Peter Van Fenema, *The International Trade in Launch Services*, (Leiden Faculty of Law: 1999) at 183 -240.

[211] *See* Peter Van Fenema, *The International Trade in Launch Services*, (Leiden Faculty of Law: 1999) at 183 – 240.

[212] *See* Peter Van Fenema, *The International Trade in Launch Services*, (Leiden Faculty of Law: 1999) at 205. *See also* Gordon Pike, "Chinese Launch Services" 7(2) Space Policy 103 (1991) at 111.

international market.[213] With these agreements in place, the U.S. satellite industry was poised to finally reap the rewards of satellite trade with China.

It was only six months after the conclusion of these agreements that the Tiananmen Square incident occurred. Public outcry in the United States led to the passage of trade sanctions against China, effectively suspending the above agreements.[214] The launch of satellites with U.S. origin technology on Chinese vehicles was prohibited *unless* the President waived the prohibition, on a case-by-case basis, on the grounds that it was in the national interest.[215] This prohibition remains to this day (and has been further strengthened in the *Strom Thurmond Defense Authorization Act of 1999*).

During the 1990s, both George H. W. Bush and William Clinton administrations granted a series of executive waivers in the national interest and China continued to launch U.S. satellites. This ad hoc method of approving satellite exports to China came to an end after incidents associated with Chinese launch services led to a Congressional Select Committee investigation and the passage of a Satellite Export Control Amendment within the Strom Thurmond Defense Act of 1999.

A Congressional Select Committee, chaired by Representative Christopher Cox (R-CA), was established in June 1998 to investigate concerns over Chinese acquisition of sensitive U.S. missile and space technology in connection with the launching of U.S. civilian satellites using Chinese launchers on Chinese territory.[216] Its investigation was broadened in October 1998 to include alleged security problems and possible espionage

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[213] The purpose of the trade limitations was to protect the U.S. domestic launch industry as the Chinese entered the international launch market. *See* Bill Lai, "National Subsidies in the International Commercial Launch Market" 9(1) Space Policy 17 (1993).

[214] §902 of the Foreign Relations Authorization Act, Fiscal Years 1990 and 1991 (P.L. 101-246; 22 U.S.C. 2151 note).

[215] §902 of the Foreign Relations Authorization Act, Fiscal Years 1990 and 1991 (P.L. 101-246; 22 U.S.C. 2151 note).

[216] M. May ed., *The Cox Committee Report: An Assessment* (CISAC, Stanford: 1999) at 9, available online at < http://fsi.stanford.edu/publications/cox_committee_report_the_an_assessment/>.

at the U.S. nuclear weapons laboratories.[217] The Committee released a declassified report on May, 25, 1999, that is commonly referred to as the Cox Commission Report.[218] The findings and recommendations of this report were central to Congress passing the export control reform amendments included in the Strom Thurmond Defense Act of 1999.

The incidents investigated by the Committee were three separate accidents in which the Chinese launch vehicles failed to properly deliver U.S. Comsat payloads. These spacecraft were INTELSAT 708, OPTUS B, and APSTAR 2 commercial communication satellites. The Committee found that U.S. satellite manufacturers violated U.S. export control regulations regarding the transfer of technology (in the form of technical assistance and/or data) to Chinese nationals during subsequent launch failure investigations. Furthermore, the Committee was concerned that U.S. satellite manufacturers may have assisted Chinese launch vehicle engineers in resolving technical anomalies associated with the respective launch vehicle failures. The Committee found that such assistance would not only have helped the Chinese in improving the commercial launch vehicles, but would also assist them in improving their nuclear ballistic missiles – in particular the fairings on submarine-based ballistic missiles.[219]

These findings of the Cox Commission are by no means certain. In December 1999, the members of the Center for International Security and Cooperation (CISC) at Stanford University released a report that challenged the Commission's findings. Their report concluded that "in many instances the [Cox] report does not contribute to realistic informed views" and that "some important and relevant facts are wrong and a number of conclusions are unwarranted."[220] With regards to theft and technology loss in satellite and

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[217] M. May ed., *The Cox Committee Report: An Assessment* (CISAC, Stanford: 1999) at 9, available online at < http://fsi.stanford.edu/publications/cox_committee_report_the_an_assessment/>.

[218] M. May ed., *The Cox Committee Report: An Assessment* (CISAC, Stanford: 1999) at 9, available online at < http://fsi.stanford.edu/publications/cox_committee_report_the_an_assessment/>.

[219] *See Declassified Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China* (Submitted by Rep. Cox, U.S.G.P.O, Washington D.C. ; January 3rd, 1999 – declassified May 25th, 1999).

[220] M. May ed., *The Cox Committee Report: An Assessment* (CISAC, Stanford: 1999) at 6, available online at < http://fsi.stanford.edu/publications/cox_committee_report_the_an_assessment/>.

launch vehicles failures, the CISC found that "no evidence of theft or breach of agreement by the People's Republic of China (PRC) is presented."[221]

Nonetheless, the Cox Commission wielded significant political influence. In 1998, before the Cox Report was finalized, Congress passed the Strom Thurmond Defense Act.[222] This act contains a specific Satellite Export Control Amendment, which is referenced in the Cox Report as a positive step towards "correcting security deficiencies" in the U.S. satellite export control system.[223]

The amendment instituted several important changes to the U.S. satellite export control system. First and foremost, the amendment transferred all satellites and related items that were on the Commerce Control List (CCL) of dual-use item to the United States Munitions List (USML).[224] This transfer meant that all commercial communication satellites (Comsats) were now subject to ITARs, even if the Comsat had been previously licensed for export under the EAR. The Executive Branch could no longer use its discretion to determine whether or not Comsats were best regulated as munition or dual-use items. The exceptional nature of this mandate cannot be understated. There is no other case in the entire history of U.S. export controls in which Congress selected a particular item to be mandated as either a munition or dual-use item. Since the origins of the U.S. satellite export control system, the Executive Branch had utilized internal administrative methods to periodically review the USML and CCL. The Executive would make changes to the categorization of list items as deemed appropriate to achieve enumerated export control policy goals. But since the enactment of the Strom Thurmond Defense Act of 1999, the Executive has had no discretionary authority and practically all Comsat and associated items are categorized as munitions. Therefore, regardless of the sensitive nature of the technology, foreign availability, or any other consideration that

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[221] M. May ed., *The Cox Committee Report: An Assessment* (CISAC, Stanford: 1999) at 18, available online at < http://fsi.stanford.edu/publications/cox_committee_report_the_an_assessment/>.

[222] *Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511-1516.

[223] *See Declassified Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China* (Submitted by Rep. Cox, U.S.G.P.O, Washington D.C. ; January 3rd, 1999 – declassified May 25th, 1999) at 253-254.

[224] *Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511-1516.

would warrant the regulation of a satellite or its associated equipment under the Commerce Department, all satellites must be regulated for export as munitions by the Department of State.

Waivers for the export of satellites to China for launch, formerly granted under the Tiananmen Square Trade Sanctions on a case-by-case basis with a Presidential determination of "national interest," are now subject to a Congressional reporting requirement and a waiver on the grounds of "U.S. national security interests."[225] These higher standards make it more difficult for the President to issue an export waiver. In fact, no Presidential waivers have been granted since the enactment of the amendment.

The amendment also institutes special national security controls on satellite exports. These controls include: (1) mandatory technology control plans, (2) mandatory monitors and reimbursement, (3) mandatory licenses for crash-investigations, (4) mandatory advance notification of meetings with any foreign person or entity providing launch services, (5) mandatory intelligence community review, and (6) mandatory notification to Congress. These controls are *in addition* to the controls mandated under Arms Export Control Act for ITAR items. NATO and major non-allied NATO allies of the U.S. are granted exemption from these additional controls.[226] However, within the ITAR regime there is an exception to this exception. ITAR §124.15(c) provides the additional controls "may nonetheless be applied, in addition to any other export controls... as appropriate for the furtherance of national security and foreign policy of the United States."[227]

Key Provisions of the Strom Thurmond Defense Act - Satellite Export Control Amendments §1511-1516

§1511(1): Policy **-** "It is the sense of Congress that United States business interests must not be placed above United States national security interests."

[225] *Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511-1516.

[226] *Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511-1516.

[227] *See* ITAR 22 C.F.R. §124.15 (2009).

§1513(a): Control of Satellites on the U.S. Munitions List - "Notwithstanding any other provision of law, all satellites and related items that are on the Commerce Control List of dual-use items in the Export Administration Regulations on the date of the enactment of this Act shall be transferred to the United States Munitions List and Controlled under Section 38 of the Arms Control Act (22 U.S.C. 2778)"

§1514(a)(1): Mandatory Technology Controls Plans – "All export licenses shall require a technology transfer control plan approved by the Secretary of Defense and an encryption technology control plan approved by the Director of the National Security Agency."

§1514(a)(2)(A): Mandatory Monitors and Reimbursement – "In any case in which a license is approved for launch in a foreign country, the Secretary of Defense shall monitor all aspects of the launch in order to ensure that no unauthorized transfers of technology occur, including technical assistance and technical data. The costs of such monitoring shall be fully reimbursed to the Department of Defense by person or entities receiving such services."

§1514(b) Exception – "[§1514 NATIONAL SECURITY CONTROLS]...shall not apply to the export of a satellite or related items for launch in, or by nationals of, a country that is a member of NATO or is a major Non-NATO ally of the United States"

§1515: Report on Export of Satellites for Launch by the P.R.C. – "Each report to Congress pursuant to subsection (b) §902 of the Foreign Relations Authorization Act, Fiscal Years 1990 and 1991 (22 U.S.C. 2151; P.L. 101-246) to waive restrictions contained in subsection (a) of that section on the export to P.R.C. of any satellite of U.S. origin or related items shall be accompanied by a detailed justification setting forth the following...(4) The reasons why the proposed satellite launch is in the national security interests of the United States."

II. The need for regulatory convergence & U.S. Controls as a de facto "unilateral" international regime

After the Strom Thurmond Defence Act and the re-categorization of all satellites to the ITAR USML, the United States had to resolve an issue of international regulatory coordination.[228] With the demise of COCOM, the U.S. no longer had an international arrangement with which to achieve effective Comsat export control coordination. While the Wassenaar Arrangement serves as a useful transparency arrangement, licensing decisions for items on control lists do *not* require consent of fellow arrangement Members.[229] Europe had adopted a more liberal approach to controlling Comsat exports, categorizing them as dual-use goods and engaging in Comsat trade with China. As a result, the U.S. and Europe could not achieve policy coordination on Comsat export controls. This failure to achieve coordination with Europe was (and continues to be) a serious issue because Europe is the only other major Comsat manufacturer and exporter. Policy divergence between the United States and Europe is therefore a complete international regulatory divergence – e.g. it is a divergence between the only two regulatory actors. Such a divergence challenges U.S. economic, foreign policy, and national security interests associated with Comsat export control.

For example, consider the economics of the international Comsat market. Since the mid-1990s, Europe has adopted a more commercially oriented dual-use approach for export controls of commercial communication satellites for sale or launch.[230] Without regulatory coordination, the United States would be imposing more stringent controls on

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[228] *See* Daniel Drezner, *All Politics is Global,* (Princeton: Princeton University Press, 2007) at 11. "Regulatory coordination is defined as the codified adjustment of standards in order to recognize or accommodate regulatory frameworks from other countries."

[229] *See* Richard Cupitt & Suzette Grillot, "COCOM is Dead, Long Live COCOM: Persistence and Change in Multilateral Security Institutions" 27 B.J. Pol. S. 361 at 364 (1997). "Decisions on some licences were subject to COCOM review. These licence decisions, and decisions to modify the lists of controlled items or proscribed countries, required unanimous consent. This meant that the country with the most stringent control standards, generally the United States, held a veto over all licences subject to review and over the deletion of items." *Id.*

[230] *See* Antonella Bini, "Export Control of Space Items: Preserving Europe's advantage" 23(2) Space Policy 70 (2007). *See also* Regulations, Council Regulation (EC) No 428/2009, *Setting up a Community Regime for the Control of Exports, transfer, brokering, and transit of dual-use goods (re-cast)*, [2009] O.J. L 134.

U.S. exporters while European sources could export with less regulatory barriers. (Note: The nature of U.S.-E.U. regulatory divergence is discussed *infra* in Sections 3 and 4). The regulatory costs associated with ITAR compliance can be significantly higher when compared to European dual-use controls. (Note: The costs of regulatory divergence are discussed in detail *infra* in Chapter 5). If European States impose lower cost regulatory barriers, this cost discount results in a competitive advantage for European manufacturers.[231] The United States also has adopted a satellite trade-embargo against China. If the embargo is not observed by European manufacturing States, then U.S. manufacturers would face a significant competitive disadvantage as European Comsat manufacturers could access cheaper Chinese launch vehicles.

U.S. foreign policy goals associated with the Tiananmen Square Sanctions would be undermined if Europe traded with the Chinese. The economic and political pressures of the sanctions are only effective if the Chinese have no alternative market from which to access sophisticated Comsats. Likewise, the boycott of U.S. manufacturers from Chinese launch services is only effective *if* European manufactures also participated in the boycott.[232]

So with no binding international agreement and a failure to achieve policy coordination with Europe, the United States created a "unilateral" international Comsat export control regime. The way this "unilateral" regime works is as follows. The U.S ITAR regime applies to all exported Comsats and associated space technologies (SQUIPE).[233] If a foreign manufacturer includes U.S. origin parts within their satellite system, the foreign manufacturers *cannot* re-export the U.S. origin part without explicit permission from the United States Department of State.[234] The practical result is that a

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[231] *See* Ryan Zelnio, "Whose Jurisdiction over the U.S. commercial satellite industry?" 23(4) Space Policy 221 (2007) at 231. *See also* Garcia-Alonso M., "The role of technology security in model trade with horizontal differentiation" 18(5) Int. J. of Industrial Organization 747 (2000).

[232] This conclusion is based on the proposition that, so long as European Comsats are equivalent to U.S., the benefits of trade for China associated with the Chinese launch and/or operation of Comsats are roughly equivalent for China regardless of the State of origin.

[233] 22 C.F.R. §120.17 (2009). *See* 22 U.S.C. §2778 et seq. (2009).

[234] 22 C.F.R. §120.17 (2009). *See* 22 U.S.C. §2778 et seq. (2009).

foreign manufacturer cannot export *its satellite* without permission from the United States. The United States therefore has a de facto veto over all re-exported Comsats with U.S. origin technology content.

Some legal commentators have argued that this application of U.S. law is without legitimate jurisdiction under international law.[235] Their argument follows that once an item has been purchased and exported, the U.S. no longer has jurisdictional grounds to control the exported item. The theoretical basis of this argument rests on the proposition that there exists an insufficient nexus between the State and the objection of its assertion of jurisdiction.[236] As such, territorial jurisdiction should be considered primary and exterritorial jurisdiction must be restrained in deference to the State where the act or omission occurs.[237]

However, this is an erroneous line of reasoning, for the following reasons. First, the U.S. is not exerting jurisdiction over the item per se. Instead, the U.S. seeks enforcement actions against the legal parties to an export license who violate the terms of the license. Second, enforcement actions are linked to a jurisdictional basis of territory or nationality. U.S. authorities will either exercise jurisdiction over property and persons within the territory of the United States or in coordination with foreign governments via international agreements governing enforcement activities in foreign territories. Relying on the legal reasoning of the *Lotus Case* and the effects doctrine, the U.S. justifies that a sufficient nexus exists when an extra-territorial act violates U.S. domestic law.[238] Furthermore, the actual assertion of jurisdiction only takes place over a foreign person and/or their property on the basis of territorial or national jurisdiction.

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[235] *See* Andreas F. Lowenfeld, "Trade Controls for Political Ends" 4 Chi. J.Iint'l L. 355 (2003). *See also*, Kenneth Abbott, "Defining the Extra-territorial Reach of American Export Controls: Congress as Catalyst" 17 Cornell Int. Law. J. 79 (1984).

[236] *See* Cedric Ryngaret, "Extraterritorial Export Controls" 7(3) Chinese J. of Int. Law 625 (2008). *C.F. See Encyclopedia of International Law Vol. III*, (Amsterdam: Max Plank Institute of Comparative Law, 1992-2001), Rudolph Bernhardt Ed., "Jurisdiction" by Bernard Oxman at 56.

[237] *See* Cedric Ryngaret, "Extraterritorial Export Controls" 7(3) Chinese J. of Int. Law 625 (2008). *C.F. See Encyclopedia of International Law Vol. III*, (Amsterdam: Max Plank Institute of Comparative Law, 1992-2001), Rudolph Bernhardt Ed., "Jurisdiction" by Bernard Oxman at 60.

[238] *See Lotus Case (France v Turkey)* (*Judgment*) [1927] PCIJ (ser A) No 10.

This "unilateral" regime only works as long as European (e.g. foreign) Comsats contain U.S. origin parts and the United States is able to enforce the terms of its export licenses. Enforcement of U.S. export control law beyond the borders of the United States requires legal agreements with foreign countries to coordinate customs, security, criminal/civil sanctions, and police enforcement. Within the U.S. borders, enforcement is a viable option so long as in person or in rem jurisdiction can be exercised. As all major European Comsat manufacturers have physical or financial interests within the United States, in theory enforcement at the primary manufacturer level is not limited by jurisdictional concerns. Secondary and tertiary manufacturers may be able to evade effective punishment, but that is dependent on the degree of enforcement coordination between States.

So the real limiting factor to this U.S. "unilateral" regime is the inclusion of U.S. parts on European Comsats. If Europe can substitute U.S. origin parts with non-U.S. origin parts, they are no longer subject to U.S. export control licensing terms. Freed from U.S. constraints, they need only conform to European controls. For example, Europe does not boycott the launching of Comsats on Chinese launch vehicles *nor* does it boycott the sale of Comsats to China. The ability to substitute U.S. origin parts would result in significant improvement in the exporters' freedom-of-action and more importantly open-up the exporter to the financial benefits of trade with China.[239]

In 1999, when the U.S. transferred Comsats to State Department jurisdiction under ITAR, the United States had a privileged position of hegemony in certain areas of Comsat technology. At that time, virtually all Comsats manufactured in Europe of comparative capability had integrated U.S. origin technology. But European manufacturers recognized the need to develop indigenous Comsat technologies for substitution with U.S. origin parts. Since 1999 Europe has made a concerted effort to manufacture "ITAR-Free" Comsats of equivalent capability to U.S. satellites and by

[239] *See* Regulations, Council Regulation (EC) No 428/2009, Article 4(2), *Setting up a Community Regime for the Control of Exports, transfer, brokering, and transit of dual-use goods (re-cast)*, [2009] O.J. L 134. China is not subject to a Comsat embargo under Article 4(2).

many measures they are succeeding.[240] European manufacturers, such as EADS Aerospace [Netherlands], Thales-Alenia [France/Italy], and dozens of smaller European companies now produce ITAR-free satellites and parts.[241] European satellites are launching on Chinese launch vehicles.[242] It is only a matter of time before U.S. origin parts are completely substituted and the U.S. can no longer rely on its domestic export licensing laws to achieve international Comsat export control regulatory convergence.

C. European Comsat Export Controls

European regulation of export control is dependent on the categorization of the export as either conventional armaments (e.g. munitions) or dual-use goods. Conventional armaments fall outside European Union competence and Member States may exempt the production and trade of arms from the rules of the common market.[243] In practice, "each Member State sets up its own policy and procedures for the export of

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[240] *See* Benjamin Sutherland, "Why America is Lost in Space" *Newsweek* (9 February 2009) online: Newsweek Online <http://www.newsweek.com/id/182544>. *See* Sandra Erwin, "Export Rules under Fire for Eroding U.S. Space Industry" *National Defense Magazine* (June 2009) online: < http://www.nationaldefensemagazine.org/archive/2009/June/Pages/ExportRulesUnderFireforErodingUSSpaceIndustry.aspx> . *See* National Research Council. *Beyond Fortress America: National Security Controls on Science and Technology in a Globalized World,* (National Academy Press: Washington D.C, 2009). *See* John Hillery, "U.S. Satellite Export Control Policy" (Center for Security and International Studies: Sept. 20 2006). *See* Peter Brown, "No Chinese Rockets for U.S. Satellites Yet" *Asia Times* (19 March 2009) online: <http://www.atimes.com/atimes/China/KC19Ad01.html>.

[241] *See* Benjamin Sutherland, "Why America is Lost in Space" *Newsweek* (9 February 2009) online: Newsweek Online <http://www.newsweek.com/id/182544>.

[242] *See* Andy Pasztor, "China to Launch Satellite for France's Eutelsat" *Wall Street Journal Asia* (25 February 2009) online <http://online.wsj.com/article/SB123550142763361701.html>. *See* Peter Selding, "China Launches New Communications Satellite" (10 June 2008) online: *Space.com* <http://www.space.com/missionlaunches/080610-chinasat9-longmarch3b.html>.

[243] *Consolidated Version of the Treaty on the Functioning of the European Union* (April 15th, 2011). Article 346 states:

"1. The provisions of this Treaty shall not preclude the application of the following rules:

(a) no Member State shall be obliged to supply information the disclosure of which it considers contrary to the essential interests of its security;

(b) any Member State may take such measures as it considers necessary for the protection of the essential interests of its security which are connected with the production of or trade in arms, munitions and war material; such measures shall not adversely affect the conditions of competition in the common market regarding products which are not intended for specifically military purposes."

conventional arms."[244] Dual-use goods fall within E.U. competence and the E.U. has the authority to obligate all Member States to require licenses "to export the items on the list and to have appropriate penalties for violations as well as effective systems for enforcing the relevant legislation."[245] Dual-use export control regulations are therefore harmonized within the European Union.

The E.U. exercises exclusive authority over dual-use goods per Council Regulation (EC) No.428/2009.[246] Council Regulation No.428/2009 provides for a common Community export licensing system, control list, and a general export authorization (CGEA). Member States implement Council Regulation (EC) No. 428/2009 by issuing licenses and enforcing export control violations.[247] Coordination on customs control (e.g. information about license denials) is carried out by the European Commission's Directorate-General for Taxation and Customs Union via the E.U. Customs Security Program.

Dual-use items are listed in Annex I and Annex IV to Council Regulation No. 428/2009. Annex I is a list of dual-use items that require export authorization for export from the E.U. Annex IV "lists items that are considered so sensitive that they require authorization even before they are transferred from one E.U. State to another –on other words, it sets out exception to the free movement of goods."[248] Annex II sets the conditions for the CGEA.

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[244] Yann Aubin & Arnaud Idiart, *Export Control Law and Regulations Handbooks,* (Kluwer Law International: 2007) at 111.

[245] Anna Wetter, *Enforcing European Union Law on Exports of Dual-Use Goods,* (Oxford University Press: 2009) at 49. *See Treaty Establishing the European Community* (TEC), 25 March 1957.

[246] *See* Article 4(2), Regulations, Council Regulation (EC) No 428/2009, *Setting up a Community Regime for the Control of Exports, transfer, brokering, and transit of dual-use goods (re-cast)*, [2009] O.J. L 134. *See* Article 113, *Treaty Establishing the European Community* (TEC), 25 March 1957.

[247] Anna Wetter, *Enforcing European Union Law on Exports of Dual-Use Goods,* (Oxford University Press: 2009) at 49. *See* Regulations, Council Regulation (EC) No 428/2009, Article 9, *Setting up a Community Regime for the Control of Exports, transfer, brokering, and transit of dual-use goods (re-cast)*, [2009] O.J. L 134.

[248] Anna Wetter, *Enforcing European Union Law on Exports of Dual-Use Goods,* (Oxford University Press: 2009) at 54.

There are four types of export license authorization for dual-use goods:

1) Community General Export Licenses: The CGEA is an export authorization established in the Council Regulation that provides for the export of all but the most sensitive dual-use items to particular States. This authorization is set out in Article 9 and Annex II of the Council Regulation (EC) No. 428/2009. All items not subject to the CGEA remain subject to Member State authorization.
2) National General Export Authorizations: NGEA are defined by national law. NGAs issued by individual Member States cannot conflict with CGEAs.[249]
3) Global Authorizations: An authorization granted to one specific exporter in respect of a type or category of dual-use item which may be valid for exports to one or more specified end users and/or in one or more specified third countries.[250]
4) Individual Export Authorizations: An authorization granted to one specific exporter for one end user or consignee in a third country and covering one or more dual-use items.[251]

Comsats and their associated components are categorized as dual-use items under Annex 1. Export authorization is required for the export of Comsats from the European Union.[252] Authorization is granted by the competent authorities of the Member State where the exporter is located.[253] Exporters supply the competent authorities with all relevant information required for their applications for individual and global export authorization so as to provide complete information to the national competent authorities in particular on the end user, the country of destination and the end use of the item

[249] *See* Article 2(11), Regulations, Council Regulation (EC) No 428/2009, *Setting up a Community Regime for the Control of Exports, transfer, brokering, and transit of dual-use goods (re-cast)*, [2009] O.J. L 134.

[250] *See* Article 2(10), Regulations, Council Regulation (EC) No 428/2009, *Setting up a Community Regime for the Control of Exports, transfer, brokering, and transit of dual-use goods (re-cast)*, [2009] O.J. L 134.

[251] *See* Article 2(8), Regulations, Council Regulation (EC) No 428/2009, *Setting up a Community Regime for the Control of Exports, transfer, brokering, and transit of dual-use goods (re-cast)*, [2009] O.J. L 134.

[252] *See* Article 3, Regulations, Council Regulation (EC) No 428/2009, *Setting up a Community Regime for the Control of Exports, transfer, brokering, and transit of dual-use goods (re-cast)*, [2009] O.J. L 134.

[253] *See* Article 9(2), Regulations, Council Regulation (EC) No 428/2009, *Setting up a Community Regime for the Control of Exports, transfer, brokering, and transit of dual-use goods (re-cast)*, [2009] O.J. L 134.

exported. The authorization may be subject, if appropriate, to an end-use statement or other export verification mechanism.

Article 12 of Council Regulation (EC) No. 428/2009 states that:

> "In deciding whether or not to grant an export authorization, Member States must take into account all relevant consideration including:
>
> (a) The obligations and commitments they have each accepted as members of the relevant international non-proliferation regimes and export control arrangements, or by ratification of relevant international treaties;
>
> (b) Their obligations under sanctions imposed by a common position or a joint action adopted by the Council or by a decision of the Organization for Security Cooperation in Europe (OSCE) or by a binding resolution of the Security Council of the United Nations;
>
> (c) Considerations of national foreign and security policy, including those covered by Council Common Position 2008/944/CFSP of 8 December 2008 defining common rules governing control of exports of military technology and equipment;
>
> (d) Considerations about intended end use and the risk of diversion."[254]

In practice, Member States implement export authorization under national legislation and regulation in compliance with E.U. policy and regulation. Member States control satellites and other space-related goods as either munitions or dual-use goods. The ultimate decision on item categorization for items not listed in Council Regulation (EC) No. 428/2009 is at the discretion of the State.

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[254] Article 12, Regulations, Council Regulation (EC) No 428/2009, *Setting up a Community Regime for the Control of Exports, transfer, brokering, and transit of dual-use goods (re-cast)*, [2009] O.J. L 134.

For example, in France exports of civil telecom satellites (as well as their associated equipment and ground stations) are controlled as dual-use goods and technology in accordance with Council Regulation No. 428/2009.[255] French Comsat export applicants file with the *Service des Titres du Commerce Exterieur* (SETICE). The application is reviewed by the Export Control Office of Dual-Use Goods in the French Ministry of Economy, Finance and Industry (MINEFI). International proliferation control lists (e.g. MTCR, Wassenaar), U.N. sanctions, and E.U. embargoes are reviewed for compliance. If the Comsat is being exported to a CGEA State, so long as French authorities have no reason to believe the Comsat has a military end-use, the Comsat is exported under a European General license. If the Comsat it being exported elsewhere (e.g. China), France will determine what is the most appropriate license type (e.g. individual, global or general).

If France declines the license, it must do so on the grounds authorized in Article 12 of Council Regulation (EC) No. 428/2009. Other Member States are informed of the denial via Commission's Directorate-General for Taxation and Customs Union via the E.U. Customs Security Program.

D. Comparative Analysis of U.S. - E.U. Comsat Control

To what degree are U.S. and European Comsat export control regulation coordinated? To answer this question, three particular elements of U.S. and E.U. law have been selected for comparative analysis: (1) Comsat Control Categorization (e.g. munition or dual-use), (2) China foreign policy associated controls, and (3) enforcement. These elements have been selected because they represent the most relevant aspects *of the issue of U.S.-E.U. regulatory divergence*.

I. Comsat Categorization

[255] *See* Yann Aubin & Arnaud Idiart, *Export Control Law and Regulations Handbooks,* (Kluwer Law International: 2007) at 153.

As discussed *supra*, the U.S. categorizes Comsats as munitions while the E.U. categorizes as dual-use. This is the most significant regulatory divergence amongst these two actors. This divergence results in differences throughout the export licensing, post-licensing control, and enforcement process. It reflects a fundamental difference in policy reasoning regarding the geo-political and military impact of exporting Comsats for launch or selling a Comsat to a foreign State. When compared to foreign jurisdictions, U.S. Comsat exports are subject to more restrictions on export and re-export, U.S. export licensing requires more processing time, U.S. manufacturers are subject to more stringent rules and monitoring regarding communications with foreign nationals during the bidding, purchase, manufacturing, financing, insurance, launch, and post-launch stages of a satellite procurement process, and unlike European licensees, U.S. licensee applicants are financially responsible for licensing and monitoring fees.[256]

II. China Foreign Policy Controls

The United States boycotts the export of Comsats to China.[257] This boycott is only waived on a case-by-case basis with Presidential determination that such a waiver is in the "national security interests" of the United States.[258] The E.U. does not have a Comsat boycott against China. European Comsats may be launched on Chinese launch vehicles and sold to Chinese persons for operation, so long as the export satisfies standards established under Council Regulation (EC) No. 428/2009. This difference in policy regarding China is a complete regulatory divergence. It represents a fundamental difference in policy rational as regards to China's commercial and civil space program.

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[256] *See* Yann Aubin & Arnaud Idiart, *Export Control Law and Regulation Handbook* (Kluwer Law International, 2007). *See* Government Accountability Office Report, *Defense Trade: State Department Needs to Conduct Assessments to Identify and Address Inefficiencies and Challenges in the Arms Export Process* (U.S. GAO, GAO-08-710-T, Washington, D.C.; April 24th, 2008). *See* Ann Calvaresi-Barr, *Export Controls: State and Commerce Have Not Taken Basic Steps to Better Ensure U.S. Interests are Protected* (Testimony of GAO Acquisition and Sourcing Management Director before the U.S. Senate Subcommittee on Oversight of Government Management, the Federal Workforce, and the District of Colombia, Committee on Homeland Security and Governmental Affairs, Washington, D.C.; April 24, 2008). *See also*, Ram Jakhu & Joseph Wilson. "The New United States Export Control Regime: Its Impact on the Communications Satellite Industry" (2000) 25 Ann. Air & Sp. L. 157.

[257] §902 of the Foreign Relations Authorization Act, Fiscal Years 1990 and 1991 (P.L. 101-246; 22 U.S.C. 2151 note).

[258] *Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511-1516.

III. Enforcement Sanctions

In Europe, enforcement of Comsat dual-use export control laws are exclusively a function of the Member States.[259] The principle of procedural autonomy allows Member States to apply existing national enforcement mechanisms and penalties for breaches of dual-use export controls. Legal penalties for unauthorized exports from the European Community can be different depending on the Member State from which the exporter is licensed.

A survey of sanctions conducted by the European Commission illustrates the disparity of enforcement sanctions amongst Member States.[260] The variance amongst criminal sanctions ranges from a maximum of twelve years to none.[261] Most States have a maximum criminal penalty between one and ten years per violation. Administrative sanctions (including civil penalties) are in place for the majority of Member States. Some Member States impose strict civil liability for violations. This variance in enforcement sanctions lends itself to unscrupulous exporters manipulating the system by conducting illegal exports from Member States with the least stringent sanctions.

The United States imposes criminal penalty for a wilful violation of ITAR (e.g. Comsat controls) of up to ten years and/or $1,000,000 per violation. Civil penalties may be levied as high as $500,000 per violation. As compared to most E.U. member states,

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[259] *See* Regulations, Council Regulation (EC) No 428/2009, *Setting up a Community Regime for the Control of Exports, transfer, brokering, and transit of dual-use goods (re-cast)*, [2009] O.J. L 134. *See also U.N. Security Council Resolution 1540,* UN Doc. S/Res/1540 (2004).

[260] *See* Anna Wetter, *Enforcing European Union Law on Exports of Dual-Use Goods,* (Oxford University Press: 2009) at Appendix A: "Sanctions for dual-use export control violation in the E.U.", citing EC, Directorate-General for Trade, Working Party on Dual-Use Goods *, Report on the Answers to Questionnaire DS6/2005 Rev. 3 on existing sanctions-implementation of Article 19 of Council Regulation 1334/2000, DS 37/4/2005 Rev. 4*. (11 May 2006); and EC, Directorate-General for Trade, Working Party on Dual-use Goods, *Report on Sanctions imposed by EU Member States for violations of Export Control Legislation Draft Rev. 14* (September 2005).

[261] *See* Anna Wetter, *Enforcing European Union Law on Exports of Dual-Use Goods,* (Oxford University Press: 2009) at Appendix A: "Sanctions for dual-use export control violation in the E.U.", citing EC, Directorate-General for Trade, Working Party on Dual-Use Goods *, Report on the Answers to Questionnaire DS6/2005 Rev. 3 on existing sanctions-implementation of Article 19 of Council Regulation 1334/2000, DS 37/4/2005 Rev. 4*. (11 May 2006); and EC, Directorate-General for Trade, Working Party on Dual-use Goods, *Report on Sanctions imposed by EU Member States for violations of Export Control Legislation Draft Rev. 14* (September 2005).

U.S. criminal and civil penalties are in the upper range. Overall, the E.U. and U.S. achieve an intermediate degree of regulatory convergence. However this only tells us whether or not convergence has been achieved on paper. What remains unanswered is whether the enforcement and application of the respective sanctions are similar.[262]

IV. Comparative Analysis Findings

The United States and E.U. have significant Comsat export control law and policy divergence. The primary regulatory mechanisms governing Comsats are fundamentally different. Foreign policy controls relating to China are in conflict. Enforcement sanctions in the U.S. are in generally more stringent than in the E.U. and in some cases significantly more.

The following matrix illustrates:

U.S. – E.U. Comparative Comsat Export Control Matrix

	Comsat Categorization	China Foreign Policy Controls	Enforcement Sanctions
Coordination	-	-	/
Divergence	X	X	/

[(X) = Strong Degree ; (-) = Negligible Degree ; (/) = Intermediate Degree]

Given these findings, the questions arise: What economic and political consequences, if any, result from these different regulatory preferences of the U.S. and E.U.? And how are these consequences impacting the United States? These questions are examined in the next Chapter of this thesis.

[262] This quantitative data is not publicly available and is beyond the capabilities of this research thesis. But it does raise an unanswered area of empirical legal research that needs to be conducted.

E. Chapter Summary & Conclusions

The modern U.S. export control system governing Comsats is derived from an historical piece-meal legislative process. In its purest form, the U.S. control system is a trifurcated system, with commercial, military, and nuclear goods and technology subject to distinct legislative and regulatory regimes. Traditionally, the classification of particular types of goods and technology into one of these categories has been left to the discretion of the Executive, with Congress simply providing legislative authority and oversight. However in the case of Comsats, Congress took the extraordinary measure of mandating all goods and technologies as munitions, removing Executive discretion.

This decision, legislated in the STDA, resulted in an export control regulatory divergence with Europe, the prime economic competitor and only other major telecommunication manufacturing region outside of the United States. At first, this divergence did not manifest itself as a significant issue, as the United States applies extraterritorial export controls on U.S. origin technologies, and so long as foreign manufacturers included U.S. origin parts, the U.S. could restrict foreign exports. But the ability of the United States to unilaterally impose its Comsat export control system on foreign manufacturing States is eroding because Europe and other States are developing indigenous technologies that will remove this extraterritorial jurisdictional link.

The China Launch Boycott is the other major regulatory divergence between the United States and Europe. It represents a unique type of export control, intertwined with foreign policy trade restrictions and domestic U.S. concerns over missile proliferation. It is a trade restriction that has been applied using the same extraterritorial linkage as with the STDA. Its fate is therefore tied, as least in part, to the same issue of foreign indigenous technology proliferation as has been identified for Comsats controlled under the STDA.

Chapter V

U.S. – E.U. Comsat Export Control Regulatory Divergence: An Economic Impact Assessment in Light of Strategic Effectiveness

Export controls invariably impose economic costs on a state and its citizens. A state that imposes export control measures is asking its citizens to do without the immediate advantages of unrestricted trade in order to achieve competing national security and foreign policy objectives. The legitimacy of an export control can therefore be challenged on the basis of economic costs and benefits in light of their strategic effectiveness.

The U.S. Comsat export control system is currently subject to significant public criticism. Critics are calling for the revocation and/or reform of two Congressional regulatory mandates: (1) The Strom Thurmond Defense Act (STDA) mandatory listing of Comsats on the USML[263] and (2) the boycott of Chinese launch services as established in Foreign Authorizations Act 1990-91 (FAAA).[264] The principal argument is that these export controls negatively impact the U.S. Comsat industrial base without a concomitant benefit to US national security. The underlying logic of this argument is sound because the rational goal of export controls should be to achieve their strategic intent while minimizing unnecessary economic costs to the public.

As discussed in Chapter 4, these U.S. regulatory mandates have not been adopted by Europe. On the contrary, Europe regulates its Comsats as dual-use items and permits Comsat exports to China for launch and/or sale. Because Europe is the United States' primary competitor, it is logical to hypothesize that if U.S. export controls impose additional economic costs, European manufacturers not subject to U.S. controls should receive a competitive economic benefit. Europe has adopted this hypothesis and since 1999 has actively sought to develop indigenous ITAR-Free technologies, allowing

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[263] *Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511-1516.

[264] §902 of the Foreign Relations Authorization Act, Fiscal Years 1990 and 1991 (P.L. 101-246; 22 U.S.C. 2151 note).

European manufactures to more effectively compete with the United States.[265] If European efforts have been successful, and if U.S. Comsat export controls actually impose additional costs and restraints on U.S. Comsat manufacturers, then metrics of economic performance should demonstrate a decline relative to pre-mandatory USML listing.

With regards to the U.S. boycott of Chinese launch vehicles, European accessibility to lower-cost Chinese launch vehicles is a recent phenomenon. The competitive advantage this accessibility provides to European manufacturers is only just beginning to impact the international market place. However, in the near future, as Europe is able to further distance itself from U.S. ITAR technologies, it will more effectively utilize the competitive advantage of Chinese launch vehicles and this impact will be more pronounced. It is therefore important to address the current and future economic impact of this regulatory divergence with Europe, even if current quantitative empirical evidence is comparatively sparse.

Towards these ends, this Chapter assesses the economic impact of the STDA and China Launch Boycott to determine if they should be maintained in light of their strategic effectiveness. Section 1 assesses the economic impact of the STDA on the U.S. Satellite Industrial Base. Section 2 assesses the economic impact of the China Launch Boycott. Section 3 examines the strategic effectiveness of the STDA and Section 4 examines the strategic effectiveness of the China Launch Boycott. Finally, conclusions are made as to whether reform and/or repeal of these mandates should be instituted.

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[265] *See* Council of Europe, Resolution, 4th Space council Sess., *Resolution of European Space Policy* (EN), 10037/2007, (22 May 2007) at §E(11): "Stresses the need for a targeted approach for the development of strategic components, concentrated on selected critical components, for which dependency of European industry on international suppliers should be avoided, in order to achieve an optimum balance between technological independence, strategic cooperation with international partners and reliance on market forces." *See* Benjamin Sutherland, "Why America is Lost in Space" *Newsweek* (9 February 2009) online: Newsweek Online <http://www.newsweek.com/id/182544>. *See* Andy Pasztor, "China to Launch Satellite for France's Eutelsat" *Wall Street Journal Asia* (25 February 2009) online <http://online.wsj.com/article/SB123550142763361701.html>. *See* Peter Selding, "China Launches New Communications Satellite" (10 June 2008) online: *Space.com* <http://www.space.com/missionlaunches/080610-chinasat9-longmarch3b.html>.

A. Economic Impact of the STDA on the U.S. Satellite Industrial Base

Assessing the "economic impact" of any public policy choice is a difficult task. An economic activity, such as Comsat manufacturing, is subject to a range of factors that can affect a particular manufacturer or an entire industry. This complexity makes it difficult to establish a direct causal-effect relationship between any one particular public policy decision. As a result, measuring the STDA's impact on the U.S. Comsat industrial base is at its best estimating general trends. This limitation should be recognized and taken into consideration, but it should not prevent one from undertaking the task of assessment, as a well-reasoned estimate based upon qualitative and quantitative information is better than none at all.

In this section, the economic impact of the STDA on the Comsat industrial base is analyzed. The primary analysis is an examination of the claim that the STDA has resulted in lost international market share for the U.S. commercial satellite industry (of which Comsats make up the vast majority of revenue and sales). In the literature, the dominant discourse claims that the STDA has and continues to have a measurable negative impact on the U.S. space industrial base.[266] These claims often cite economic data from one of four primary sources to defend their claim (*see infra)*. The narrative adopted in the general discourse *assumes* that the data indicating a loss of revenue and relative Comsat market share since 1999 *must correlate* to the enactment of the STDA and the transfer of Comsats from the CCL to the USML. This is an erroneous assumption that is challenged *infra.*

Brief Note on Manufacturing Tiers

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[266] *See* P.J. Blount, "The ITAR Treaty and its Implications for U.S. Space Exploration Policy and the Commercial Space Industry" 73 J. Air L. & Comm. 705 (2008) at 712. *See* Mike N. Gold, "Lost In Space: A Practitioner's First-Hand Perspective on Reforming the U.S.'s Obsolete, Arrogant, and Counterproductive export control regime for space-related systems and technologies" 34(1) Journal of Space Law 163 (2008). *See* Center for Strategic and International Studies (CSIS), Briefing of the Working Group on the Health of the U.S. Space Industrial Base and the Impact of Export Controls (February 2008) online: csis.org <http://csis.org/files/media/csis/pubs/021908_csis_spaceindustryitar_final.pdf>. *See* Benjamin Sutherland, "Why America is Lost in Space" (31 January 2009) online: newsweek.com <http://www.newsweek.com/id/182544>. *See* Ram Jakhu & Joseph Wilson. "The New United States Export Control Regime: Its Impact on the Communications Satellite Industry" (2000) 25 Ann. Air & Sp. L. 157.

Simply grouping all types of manufactures together prohibits nuisance examination of economic impact. It is therefore useful to divide the space-industrial base into three categories of company: 1st tier, 2nd tier, and 3rd tier.

- The 1st tiers are "companies that sell satellite end products to commercial and/or government customers in their fields. Examples include companies selling satellites, launches, or satellite services."[267]
- The 2nd tiers are *Subcontractors*. These companies provide major components and/or subsystems to prime manufacturers.[268]
- The 3rd tiers are *Sub-Subcontractors*. These companies provide less complex components, subassemblies, structures, and material and also include services such as engineering, information technology, research and custom fabrication.[269]

I. Assessing the Empirical Sources

There are four empirical data sources that dominate the literature and are most often cited to claim that the STDA has negatively impacted the U.S. commercial satellite industry. They are as follows:

(1) The National Security Space Office Space Industrial Base Assessment (NSSO-SIBA) [2007][270]

(2) Federal Aviation Administration, Administrator of Space Transportation (FAA-AST) Commercial Space Transportation Reports [Annual][271]

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[267] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 7.

[268] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 7.

[269] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 7.

[270] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007), available online at the U.S. Bureau of Industry and Security <http://www.bis.doc.gov/defenseindustrialbaseprograms/osies/defmarketresearchrpts/exportcontrolfinalreport08-31-07master___3---bis-net-link-version---101707-receipt-from-afrl.pdf>.

(3) Department of Commerce, International Trade Administration Analysis of the U.S. Aerospace Industry [Annual] [272]

(4) Satellite Industry Association, State of the Industry Report [Annual] (prepared by Futron Corporation) [273]

As this thesis relies on these four data sources to conduct its economic impact analysis, it is appropriate first to evaluate the validity of these empirical sources *before* assessing their data and findings and reaching independent conclusions.

After a thorough review of the literature addressing the issue of U.S. Comsat export controls, it was discovered that while the aforementioned data sources are often cited, they have never been assessed for their validity. As the majority of literature on this subject is published in the law and policy fields, it was a surprising discovery. Even more surprising is that the vast majority of contributors to the discourse have arrived at the conclusion that the U.S. space industrial base has suffered significant economic costs because of the STDA USML mandate, without ever examining the validity of their empirical sources or challenging the assumption that the STDA is causally related to economic performance.

To avoid this error and assist in determining the validity of these empirical sources, each source is herein assessed.

(i) NSSO-SIBA:[274] The NSSO-SIBA was an assessment undertaken by the United States National Security Space Office (NSSO). The purpose of the NSSO-SIBA was to:

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[271] *Commercial Space Transportation: 2008 Year in Review* (Federal Aviation Administration, January 2009), available online at the Federal Aviation Administration <http://www.faa.gov/about/office_org/headquarters_offices/ast/reports_studies/year_review/>.

[272] *Flight Plan 2009: Analysis of the U.S. Aerospace Industry* (International Trade Administration, March 2009), available online the International Trade Administration <http://www.trade.gov/mas/manufacturing/OAAI/aero_reports.asp>.

[273] *State of the Industry Report - 2009* (SIA & Futron, June 2009), available online at the Satellite Industry Association <http://www.sia.org/IndustryReport.htm>.

[274] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007), available online at the U.S. Bureau of Industry and Security

-Evaluate the industrial, economic, and financial factors affecting the U.S. space industrial base,

-Determine if U.S. export controls and practices are impacting space prime contractors and 2nd/3rd tier subcontractors, and

-Develop findings and conclusions for the Space Industrial Base

The government team project lead and integrator was the U.S. Air Force Research Laboratory. This study focused on three analysis streams including Global Marketplace/Competitiveness, U.S. Industry Health, and Export Control Impacts.

Subject Population: The subject populations of the NSSO-SIBA were 274 space industry companies/businesses.

Methodology: The study was conducted from January to July 2007 in a three-phase effort. In Phase 1, the study team planned the study and gathered data; in Phase 2, the data were analyzed and integrated to develop findings; and in Phase 3, the results were documented and reported to the SIBC.

Data Sources: The NSSO-SIBA study drew from three data sources: (1) A survey self-administered to the subject population, (2) financial data from the Federal Aviation Administration, Security and Exchange Commission (SEC) forms and annual reports, and an IBIC Independent Financial Analysis, and (3) other data sources used to complement the survey.

Objectivity: It is a defendable assumption that government agencies involved have maintained sufficient objectivity to protect against institutional bias, at least to the extent necessary to protect against measurable bias. The assumption is supported by the scope of Congressional mandates establishing the Executive agencies involved in this study.

<http://www.bis.doc.gov/defenseindustrialbaseprograms/osies/defmarketresearchrpts/exportcontrolfinalreport08-31-07master___3---bis-net-link-version---101707-receipt-from-afrl.pdf>.

Strengths:

-A review of survey questions does not reveal any intentional bias on the part of the NSSO.

-Survey responses were mandated by federal law, subject to criminal and civil penalty.[275] This may have tempered the tendency for self-interested survey response bias.

Weaknesses:

-The data set is in part based on a survey of space industries conducted by the NSSO. Self-interest and subjectivity will exist in survey responses from the space industrial base.

-The report and survey only examine data from 2003 to 2007.

-In some instances, the report fails to provide statistical data that distinguishes between manufacturers and service providers.

-The analysis of the U.S. share of commercial communication satellites used mixed data sources. For example, in some cases, market share as a percentage of gross sales was utilized, but in other cases, it was market share as a percentage of payloads.[276] This error derived from the use of Federal Aviation Administration Commercial Space Transportation Report statistics to supplement publicly available market share data. The result is ambiguity is the statistics.

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[275] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007), available online at the U.S. Bureau of Industry and Security <http://www.bis.doc.gov/defenseindustrialbaseprograms/osies/defmarketresearchrpts/exportcontrolfinalreport08-31-07master___3---bis-net-link-version---101707-receipt-from-afrl.pdf> at 49.

[276] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007), available online at the U.S. Bureau of Industry and Security <http://www.bis.doc.gov/defenseindustrialbaseprograms/osies/defmarketresearchrpts/exportcontrolfinalreport08-31-07master___3---bis-net-link-version---101707-receipt-from-afrl.pdf> at 17.

-The data on the global space market place, including statistics associated with commercial satellite market share and revenues are all derived from the SIA State of the Industry Annual Report. As discussed *infra,* the SIA Report is of questionable validity.

Reliability: This report is well cited and sourced. It carries a strong presumption of validity. However, its data with regards to the global space market place, including statistics associated with commercial satellite market share and revenues are all derived from the SIA State of the Industry Annual Report. To the extent this report relies on the SIA Annual Report, there are concerns of validity and objectivity.

Utility: This report is useful for examining economic characteristics of the U.S. commercial satellite manufacturing base, in particular the R & D expenditures as a percentage of gross sales, to the extent the report relied on independent research, analysis, and data collection.

(ii) FAA Space Transportation Reports:[277] This report summarizes U.S. and international launch activities each calendar year and provides a historical look at the past five years of commercial launch activity. The FAA has been issuing this report since 1997.

Subject Population: International commercial launches (providers).

Methodology: The data sets are derived from licensed U.S. launches and internationally registered launches. Launch data is classified into the following data sets: (1) Orbital v. Suborbital, (2) Internationally Competed, (3) Commercial Payload, and (4) Orbits. The Orbital v. Suborbital data-set distinguishes between orbital and sub-orbital launches. The International Competed data-set is defined as "a competed launch contract in which the launch opportunity was available in

[277] *Commercial Space Transportation: 2008 Year in Review* (Federal Aviation Administration, January 2009), available online at the Federal Aviation Administration <http://www.faa.gov/about/office_org/headquarters_offices/ast/reports_studies/year_review/>.

principle to any capable launch service provider." Commercial Payloads are described as having one or more of the following characteristics: (I) the payload is operated by a private company or (II) the payload is funded by the government, but provides satellite service partially or totally through a private or semi-private company. Orbits distinguish between Geosynchronous (GEO) and Non-Geosynchronous (NGEO) orbits.

Objectivity: It is a defendable assumption that FAA has maintained sufficient objectivity to protect against institutional bias, at least to the extent necessary to protect against measurable bias. The assumption is supported by the scope of Congressional mandates establishing the Executive agencies involved in this study.

Strengths:

-Datasets are updated annually.

-Datasets for U.S. launches is assured 100% accuracy because of federal legal requirements to license all commercial launches with the FAA.[278]

-Datasets for both U.S. and non-U.S. launches are extremely reliable because of (I) international and domestic registration requirements,[279] (II) verification of launches and payloads can be verified via public corporate filings and announcements, and (III) the public nature of space launch activities.

Weaknesses:

-The report does not provide data on the value of payloads launched. They only provide data on the number of payloads launched and the value of launching services provided. This limits the usefulness of the

[278] *See Commercial Space Launch Act,* 49 U.S.C. § 70101 et seq. (2000 & Supp. 2004).

[279] *See* Article VIII, *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), 18 U.S.T. 2410, 610 U.N.T.S. 205 [Outer Space Treaty].

data when determining relative market share for commercial satellite sales.

Reliability: This report is well cited and sourced. It carries a strong presumption of validity.

Utility: This report is useful for examining launch related statistics. It has minimum utility for assessing the market share and revenues of U.S. and European commercial satellite manufactures.

(iii) Department of Commerce, International Trade Administration Analysis of the U.S. Aerospace Industry:[280] This report provides an annual assessment of the aerospace industry in the United States. Commercial space is only one part of this report. The DOC has been issuing this report since 2006.

Subject Population: U.S. Launch Service Providers and Satellite Manufacturers.

Methodology: There is no methodology in the Commercial Space Section. All statistics are derived from the FAA Space Transportation Annual Report or unnamed public sources.[281]

Objectivity: It is a defendable assumption that government agencies involved have maintained sufficient objectivity to protect against institutional bias, at least to the extent necessary to protect against measurable bias. The assumption is supported by the scope of Congressional mandates establishing the Executive agencies involved in this study.

Strengths:

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[280] *Flight Plan 2009: Analysis of the U.S. Aerospace Industry* (International Trade Administration, March 2009), available online the International Trade Administration <http://www.trade.gov/mas/manufacturing/OAAI/aero_reports.asp>.

[281] *See Flight Plan 2009: Analysis of the U.S. Aerospace Industry* (International Trade Administration, March 2009), available online the International Trade Administration <http://www.trade.gov/mas/manufacturing/OAAI/aero_reports.asp> at 19.

- None

Weaknesses:

- The commercial space section of this report has absolutely no value. It is at best a repetition of launch statistics from the FAA Space Transportation Annual Report.

-It fails to appropriately cite sources.

-It fails to provide any useful data or analysis on the U.S. commercial satellite industry.

Reliability: The validity of this report (commercial space section) is comprised by its failure to properly cite and its failure to provide any utility.

Utility: This report (commercial space section) has no utility.

(iv): **Satellite Industry Association, State of the Industry Report:** [282] The Futron Consulting Company prepares this report annually on behalf of the SIA. Its stated purpose is to provide an analysis of the satellite industry's economic performance. This report has been prepared annually since at least 2000.

Subject Population: The stated subject population are four commercial satellite industry segments: satellite services, satellite manufactures, ground equipment, and launch industry. The report fails to provide sourcing for this subject population.

Methodology: This report is prepared by the Futron Consulting Company (as a paid consultant of the SIA). The report contains no citation to specific sources. It does not provide sourcing for its satellite manufacturing data, launch industry data,

[282] *State of the Industry Reports* for 2004, 2007, and 2009 (SIA & Futron), available online at the Satellite Industry Association <http://www.sia.org/IndustryReport.htm> and < http://www.docstoc.com/docs/20082327/2007-State-of-Satellite-Industry-Report> and available in the *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 16. [Hereafter referred to as the "SIA Report".]

or revenues. The report also fails to explain its methodology on inclusion or exclusion of subject population members; it also fails to explain the number of subjects included in the data sets.

Objectivity: This report is prepared by the Futron Consulting Company (as a paid consultant of the SIA). The SIA is the lobbying organization for the U.S. commercial (primary Comsat) manufacturers. The SIA has been actively lobbying for the repeal of the STDA mandatory satellite USML listing since its enactment in 1999. The objectivity of this report is therefore questioned. It is presumed the report will be biased towards the interests of the SIA. This bias is explicitly reflected in the application of their Report Data to conclude that the STDA is causally related to a decline in revenue and market share after 1999. This bias is implicitly presumed to be present in the Report data itself.

Strengths:

-Provides clear data sets for tracking satellite manufacturing sale revenues and international market share.

-Provides data on a yearly basis over a period of several years, supporting the hypothesis of market trends.

Weaknesses:

-The report does not cite sources.

-The report provides no quantitative data beyond charts and graphs.

-The report does not distinguish between commercial satellites, military satellites, and civil satellites. As a result, revenue for distinct sectors of the satellite industry cannot be identified. It is therefore difficult to assess what sector is contributing to a year-to-year increase or decrease of market share revenue.

Reliability: The report contains no citation of data sources. The report fails to provide a method to verify its statistics. Its validity is therefore comprised and cannot be relied upon without going outside the report to verify accuracy.

Utility: The report is essentially a PowerPoint slide. It provides very useful statistics and graphs outlining the recent historical data for subject population revenue and market share. Unfortunately, the validity and objectivity of this report undermines its utility.

II. Conclusions as to the Validity of these Primary Sources

After reviewing these sources, the following findings have been reached:

Finding #1: The SIA Report is the only cited source for commercial satellite market share and revenue data in any of the aforementioned reports.

Finding #2: The validity of the SIA Report is suspect. As discussed *supra*, the SIA Report is a self-sponsored industry document that does not provide any citation on its sources.

Finding #3: The U.S. Government and academic community have adopted the SIA reports as its primary source of economic data for U.S. commercial satellite revenue and market share.

Finding #4: The NSSO-SIBA conducted an independent survey of U.S. space manufacturers and this survey is deemed a valid data source for the time-frame of 2003-2007. The NSSO-SIBA survey provides useful self-reported data for products and sales, foreign sourcing, exports, financials, and R & D expenditures. It also provides self-reported data on perceived impact of export controls on international competitiveness. However, the NSSO-SIBA report uses the SIA Report as its only source for certain economic data on satellite industry performance and is therefore suspect.

Finding #5: The FAA Annual Launch report provides valid objective data relating to payloads and launch vehicle statistics. However, with regards to hypotheses on manufacturer market share and revenue, this data is only useful as an ancillary/secondary source to corroborate. No direct manufacturing revenue and/or market share data is available beyond launch payloads.

On the basis of these findings, it is concluded that the underlying validity of the four primary public source documents providing data on the U.S. commercial satellite industry's market share and revenue is suspect, with the exception of data derived directly from the NSSO-SIBA survey and secondary launch vehicle and payload data from the FAA Annual Launch reports. This is because the SIA Report is the only primary cited source for commercial satellite market share and revenue data in any of the aforementioned reports. In order to assess whether the STDA has negatively impacted the U.S. commercial satellite industry, and to what extent, quantitative data is needed, but relying solely on the SIA reports for sourcing is insufficient. While the NSSO-SIBA survey is an objective source, the NSSO-SIBA report also incorporates SIA data. As a result, in order to strengthen the underlying validity of the ensuring analysis, alternative sources are needed to either verify or dispute the data provided by the SIA.

III. Alternative Sources

In the public discourse there are only two alternative independent data sources for commercial manufacturer revenue and market share. This first source is an article written by Ryan J. Zelnio, published in the *Journal of Space Policy* (2007).[283] The second source is the Institute for Defense Analyses *Export Controls and the U.S. Defense Industrial*

[283] Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007).

Base (2007).[284] Neither of these sources is cited in the aforementioned primary data sources.

(i): Assessment of the Zelnio Article: In his article, Mr. Zelnio creates a data base of Comsat contracts for geosynchronous satellites dating back to 1961 with information on customer, customer origin, manufacturer, satellite bus, award date, and the satellite's power and mass.[285] This data base was constructed from public launch and payload data. He also determined the competitive bid status of individual Comsat contracts and the relative technical complexity of Comsats.[286]

The competitive bid status of an individual Comsat contract is an important characteristic not identified in the SIA or NSSO-SIBA data. In some instances contracts are non-competitive because the sale is an intra-company sale between a manufacturer and service provider.[287] In other instances, contract solicitations are limited to bidders of a particular nationality (e.g. buy domestic government contracting provisions).[288]

Technical complexity is an important characteristic because the competitiveness of a satellite depends in large part on its technical characteristics. In this study, Mr. Zelnio considers mass and power complexity of particular Comsat models. This information is particularly useful when cross-assessed with other sources to determine the transponder capacity for a particular Comsat model.[289]

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[284] *Export Controls and the U.S. Defense Industrial Base* (Institute for Defense Analyses; 2007), available online at the Defense Technical Information Center < http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA465592&Location=U2&doc=GetTRDoc.pdf>.

[285] Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007) at 223

[286] Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007) at 223.

[287] Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007) at 224.

[288] Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007) at 224.

[289] *See Export Controls and the U.S. Defense Industrial Base* (Institute for Defense Analyses; 2007), available online at the Defense Technical Information Center < http://www.dtic.mil/cgi-

Using public source data, this article examines the effects of ITAR regulation on the Comsat primary manufacturing sector. The article was published in 2007.

Subject Population: All publicly known Comsat contracts for geosynchronous satellites dating back to 1961.

Methodology: A cross tabulation analyses is performed on a database of Comsat manufacturing award contracts to determine, via a quantitative analysis, if the STDA mandate of Comsat to ITARs has had effect on U.S. market-share, and if so if it is a quantifiable impact.

Objectivity: This article was written by an independent academic scholar and published in a respected peer-reviewed journal. These are strong indicia of objectivity.

Strengths:

-The data categories are extremely relevant to measuring international Comsat market competitiveness and relative market share between U.S. and E.U. manufacturers.

-The data time-frame categorizations are tailored to pre-STDA and post-STDA

-The article appropriately identifies the major Comsat manufacturers as U.S. and European, and focuses on the contracts and technical characteristics of these manufacturers

-The article enhances the data by distinguishing between competitive and non-competitive bid contracts

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bin/GetTRDoc?AD=ADA465592&Location=U2&doc=GetTRDoc.pdf> at 67. Provides transporter info for U.S. and EU Comsat models

-In the analysis to determine whether or not the decline in relative market share is causally related to the STDA USML listing, the article correctly identifies several alternative causations (including foreign availability, economic reorganization of manufacturer and service providers, and anomalies in Comsat market demand during the late 1990s).

Weaknesses:

-Does not identify the transponder capacity as a technical characteristic, but instead relies on implied capacity as a function of mass and power complexity.

Reliability: Public data sources are cited. This raises concerns over accuracy, as public data is only as accurate as the underlying sources. This article only utilized public data from one internet source (Günter's space page[290]) and did not cite any other sources. While the methodological approach of this article is very useful, the lack of citation raises concerns on the validity of the data inputs with which the methodological analysis is conducted. No other sources for statistics on Comsat contracts and/or technical characteristics are cited. I emailed the author and inquired whether he took these additional steps to ensure the accuracy of his sources. I have received a response from Mr. Zelnio on February 19th, 2010. According to Mr. Zelnio, "I used Gunter's list of Comsat contracts and then clicked on each individual satellite to get all the information on it that was available. For satellites that the information was not complete, I'd typically go to the company's webpage." [291] Mr. Zelnio was honest about the challenges he faced reaching conclusive findings on the impact of the STDA given limitations to quantitative

[290] Gunter's Space Page <http://space.skyrocket.de/> .

[291] On February 15th, 2010 I emailed Mr. Zelnio the following inquiry: "I am a researcher at the Institute of Air and Space Law. I am contacting you regarding you 2007 publication on ITARs and Comsats. Your 2007 Space Policy article was extremely well written and is being used as a primary source in my doctoral thesis. However, I did have a question regarding your methodology. Regarding your determination of Comsat contracts and technical characteristics, you cite Gunter's Space Page as your source. Can you please explain how you used Gunter's Space Page? Did you, for example, take Gunter's Space Page information on individual payloads (e.g. name, type, owner-operator, and country of origin) and cross-reference with Comsat manufacturer publications on satellite technical characteristics to test the accuracy of the public data sources relied upon? Your clarification of data set validation is greatly appreciated."

data sources. "One of the hardest things is to get good quantitative data [on this issue]."[292]

Utility: The database, analysis, and findings of this article are based on a methodological approach that examines the market share of contracts awarded, as opposed to revenue market share. This provides a different perspective that can be useful for cross-correlating revenue market share data.

(ii): Assessment of the IDA Export Control Report:[293] This report was written by the Institute of Defense Analysis for the Office of the Deputy under Secretary of Defense for Industrial Policy (2007).

Subject Population: U.S. space industrial base; GEO Comsat Market (1995-2006)

Methodology: One part of this report assessed the economic performance and competitiveness for the commercial satellite industry. Data were collected via (1) interviews with industry, academia, and government officials; (2) government and industry reports; and (3) various open publications. The report also compiled a database of all satellite launches from 1995-2006. This database was used to analyze the market position of US satellite prime contractors and subcontractors over time and to discern any changes in that position due to changes in export controls. The report also compiled a database of projected launches forecasted through 2014. In addition some companies made available their own listings of satellite wins, bids, and programs including some categorizing of "export control impacts". These contained both proprietary information as well as corporate judgments which made this data difficult to use as a primary source, but it was used as a check on the completeness of the data obtained from other sources. Other sources included a database of satellite sub-contracts using Teal Group and DACIS sources. This database was used to analyze the market position of US satellite sub-

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292 Email from Mr. Ryan Zelnio on 19 February 2010.

293 Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, January 2007).

contractors over time and to discern any changes in that position due to changes in export controls. SIA "State of the Industry" Report data were also incorporated into the analysis.

Objectivity: It is a defendable assumption that government agencies involved have maintained sufficient objectivity to protect against institutional bias, at least to the extent necessary to protect against measurable bias. The assumption is supported by the scope of Congressional mandates establishing the Executive agencies involved in this study.

Strengths:

-The sourcing for economic performance and competitiveness was well-done. Multiple sources were used and these sources were cross-referenced to check accuracy and validity.

-Qualitative data was used appropriately used to support and contrast quantitative findings.

-Assessed the international market place with metrics of competitiveness and market demand.

- Examined competitiveness and economic performance of satellite manufacturing prime manufacturers and also 2nd/3rd tier companies.

Weaknesses:

-Data set ends in 2006.

-Sources the SIA Report for particular economic performance data.

Reliability: The sourcing for this report was very thorough. One concern for accuracy and validity of results is that it does include the SIA data. However, the report itself takes note that this is industry reported data. It thereafter conducts an independent analysis of the GEO market and prime manufacturer, utilizing other data sources, identifying distinctions between its findings and the SIA report.

Utility: This report is very useful in assessing the GEO Comsat market and provides information on of actual market shares of foreign manufacturers in other countries and an analysis of why U.S. market share has declined.

IV. Concerns regarding the academic literature

A review of the academic literature reveals a disconcerting reliance on the SIA Report data and the assumptive conclusion that a decline in U.S. satellite revenue necessarily correlates to the Strom Thurmond Defense Act of 1999. The following examples illustrate:

1) George Abby & Neal Lane, *United States Policy: Challenges and Opportunities Gone Astray*, (Cambridge: American Academy of Arts and Sciences, 2009) at 5-7: Cites the NSSO-SIBA report statistics on compliance costs with ITAR (the NSSO-SIBA statistics are derived in part from the SIA Report). [294]
2) Antonella Bini, "Export control of space items: Preserving Europe's advantage" 23 Space Policy 70 (2007) at 70. Cites the SIA Report data in support of the proposition that the "US share of global satellite sales decreased from 64% of the $12.4 billion market in 1998 to 36% in 2002."[295]
3) CSIS Briefing Report, *Health of U.S. Space Industrial Base (2008)*. This report cites SIA Report data to support the conclusion that "the U.S. share of foreign space markets is steadily declining."[296] The CSIS briefing report also relies cites NSSO-SIBA Report and the NSSO-SIBA report relies, in part, on

[294] George Abby & Neal Lane, *United States Policy: Challenges and Opportunities Gone Astray*, (Cambridge: American Academy of Arts and Sciences, 2009) at 5-7

[295] Antonella Bini, "Export control of space items: Preserving Europe's advantage" 23 Space Policy 70 (2007) at 70.

[296] *Health of the U.S. Space Industrial Base and the Impact of Export Controls,* (Center for Strategic and International Studies, Washington D.C.: February 2008 at 50. Available online at *CSIS* < http://csis.org/files/media/csis/pubs/021908_csis_spaceindustryitar_final.pdf>.

SIA Report data.

4) *Defense Industrial Base Assessment: U.S. Space Industry*. In its assessment in determining how U.S. share of market revenue, it relies solely on SIA Report.[297]

This error in source reliance is not limited to citing the SIA Report. In two separate scholarly articles, statistics that U.S. Comsat market share decline from 83% to 50% since 1999 are cited to support the proposition that the STDA has negatively impacted U.S. satellite manufacturers.[298] In both articles, these statistics are referenced to the same source and only this one source, an online "article" (not subject to an editor or peer-review) written by none other than Ryan Zelnio. This online Zelnio "article" has no citation at all, let alone for its statistical claims that "prior to the change in export controls in 1999, the US dominated the commercial satellite-manufacturing field with an average market share of 83 percent. Since that time, market share has declined to 50 percent."[299] As a matter of fact, one year after the "publication" of this online "article", in his 2007 peer-reviewed Journal of Space Policy article, Mr. Zelnio changes his statistical conclusion, stating that: "Before the changes in export control in 1999, the USA was winning on average 80% of all competitive [Comsat] contracts. Since 1999, the lead U.S. companies shared has dropped considerably to around 60%."[300]

These issues are raised because it shows an overreliance on the SIA Report and a corruption of the discourse in favor of the SIA interpretation of historical market data.

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[297] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007), available online at the U.S. Bureau of Industry and Security <http://www.bis.doc.gov/defenseindustrialbaseprograms/osies/defmarketresearchrpts/exportcontrolfinalreport08-31-07master___3---bis-net-link-version---101707-receipt-from-afrl.pdf> at 16.

[298] *See* Mike N. Gold, "Lost In Space: A Practitioner's First-Hand Perspective on Reforming the U.S.'s Obsolete, Arrogant, and Counterproductive export control regime for space-related systems and technologies" 34(1) Journal of Space Law 163 (2008) at 167. *See* P.J. Blount, "The ITAR Trety and its Implications for U.S. Space Exploration Policy and the Commercial Space Industry" 73 (J. Air L. & Comm. 705 (2008) at 712.

[299] Ryan Zelnio, "The effects of export control on the space industry" (16 January 2006) on the website *The Space Review:* <http://www.thespacereview.com/article/533/1>.

[300] Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007) at 227.

This is by no means an attack on any individual in the academic community (many of whom I know personally). Instead, it is the identification of a failure in the space law community as a whole to properly vet a fundamental quantitative source, the SIA Report. The findings of the SIA report have made its way into Federal Reports (such as the NSSO-SIBA) which are in turn cited as reliable sources because they are a government report. These concerns are raised with the sincere goal of educating and enlightening my colleagues so that more accurate conclusions can be reached as to the actual impact of the STDA on U.S. economic performance and competitiveness.

V. Extracting Empirical Findings on the Basis of these Sources

In the following section, several metrics of U.S. commercial satellite industrial performance and competitiveness are assessed against quantitative and qualitative data derived from the aforementioned six studies. These metrics are: (1) Market Share of U.S. Commercial Satellite Prime Manufactures, (2) Market Share of 2^{nd} and 3^{rd} Tier Companies, (3) Lost Sales, (4) Compliance Costs, and (5) Restrictions on Global Operations.

Amongst the six aforementioned sources, the most useful and valid for the purposes of determining the economic competitiveness and performance of the U.S. commercial satellite sector is the IDA report. The Zelnio article is useful in addressing technical comparability and market trends. The SIA Report is useful because it identifies overall satellite industry performance, but its validity is questionable. The NSSO-SIBA survey is useful because its survey is a supplementary data source that provides self-reported quantitative and qualitative data on 1^{st}, 2^{nd} and 3^{rd} tier manufacturers.

For this reason, the primary sourcing for these metrics is the IDA report, with supplementary sourcing from the SIA Report, and NSSO-SIBA survey, Zelnio Article, and other secondary sources. Conflicting statistical data is identified and comparative ranges are provided.

i. Market Share of U.S. Commercial Satellite Prime Manufacturers 1996-2009

Before looking at the numbers on market share, it is useful to first understand how the international market works. First of all, Comsats are the predominant export market (based on the number of commercial satellites sold and revenue generated).[301] This high correlation between Comsats and commercial satellite revenues allows for quantitative *export* data on commercial satellite prime manufacturers (generally) to be considered analogous to Comsat manufacturing (specifically).

Second, the global Comsat market is an oligarchy. Only a handful of Comsat service companies purchase and operate the vast majority of Comsats manufactured. The largest of these service companies are: Arabsat, Eutelsat, Intelsat, Inmarsat, and SES. Amongst these five companies, historical preference to a particular manufacturer has been identified. Eutelsat and Arabsat have always awarded contracts to European manufacturers.[302] Inmarsat and SES historically use both European and U.S. vendors.[303] Intelsat historically used only U.S. vendors, but recently has purchased European satellites.[304]

Third, major Comsat manufacturer States tend to prefer domestic manufacturers.[305] This domestic preference means that in many instances, contract

[301] *See* Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A..: January 2007) at A-34.

[302] *See* Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-101. *See also*, Arabsat Fleet information at Arabsat Homepage: < http://www.arabsat.com/Pages/Fleet.aspx>. *See also*, Eutelsat Fleet information at Eutelsat Homepage: < http://www.eutelsat.com/satellites/satellite-fleet.html>.

[303] *See* Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-101. *See also*, SES fleet information at the SES Website: <. http://www.ses-astra.com/business/en/satellite-fleet/index.php>. *See also*, Inmarsat fleet information at the Inmarsat website: < http://www.inmarsat.com/Services/Maritime/Fleet/default.aspx?language=EN&textonly=False> .

[304] *See* Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-101. *See also*, Intelsat fleet information at Intelsat website: < http://www.intelsat.com/network/satellite/>.

[305] *See Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 14-15.

solicitations are either closed or are not competitive in actual practice. This preference can be assumed to be stronger when the purchasing companies are State-controlled or have the State as a shareholder. Take, for example, Russia: from 1995 to 2006 only one U.S. GEO Comsat was purchased and all other purchases were from Russian manufacturers.[306] A similar prediction can be made on the future of Chinese demand for Comsats. For the time being, China is purchasing European Comsats. But it is very likely that China will preference Chinese manufacturers *once* Chinese technology is comparative to European and U.S. Comsats.

Fourth, States without an indigenous Comsat manufacturer often show preference towards one vendor (or nationality) over a period of time.[307] This is probably a result of both politics and business. From the political perspective, States often use international contracting to advance other political objectives. For example, contracts may be awarded on the basis of political horse-trading for benefits not directly related to the purchasing contract. From the business perspective, once a Comsat manufacturer has an established relationship with an operator, future contracts become easier to win, in part because the established relationships and technical integration with a particular manufacturer's goods provides a defendable position.

As a result, the actual "competitive" market for Comsats is much smaller than the operator market taken in its entirety. Based on historical data, the "competitive" market for Comsats is the following operators or operator States: (1) Inmarsat, (2) Intelsat, (3) SES, (4) Argentina, (5) Australia, (6) Brazil, (7) Canada, (8) Egypt, (9) Malaysia, (10) South Korea, (11) Taiwan, and (12) Thailand.[308]

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[306] Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-97.

[307] *See* Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-99. *See also Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 14-15.

[308] *See* Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-99. *See also*, Thaicom Fleet information on Thaicom website: < http://www.thaicom.net/eng/satellite_thaicom5.aspx>.

a. Examination of the economic data

The broadest measure of market share data comes from the SIA Reports. The SIA Report provides data on the global primary satellite manufacturing revenue and U.S. primary satellite manufacturing revenue. This data shows global and U.S. trends in the satellite primary manufacturing market. Note that this data included military and civil government primary manufacturing satellites. Note also that this data is based on manufacturing revenues recorded in the year the satellite was delivered/launched, not when the contract was awarded.

Global Market Trends[309]

1st: From 1996 – 1998, global revenues were increasing.

2nd: From 1999-2005, global revenues decreased, reaching their low in 2005.

3rd: From 2005 – 2008, the market rebounded, returning to 1996-1998 levels.

U.S. Revenue Trends[310]

1st: From 1996-1999, the U.S. accounted for approximately 60% of global revenues

2nd: From 1999 – 2001, U.S. share of global revenues dropped to approximately 40%

3rd: From 2001-2007, U.S. share of global revenues held at approximately 40%

4th: In 2008, U.S. share of global revenue declined to approximately 30%

The following charts illustrate these trends: [311]

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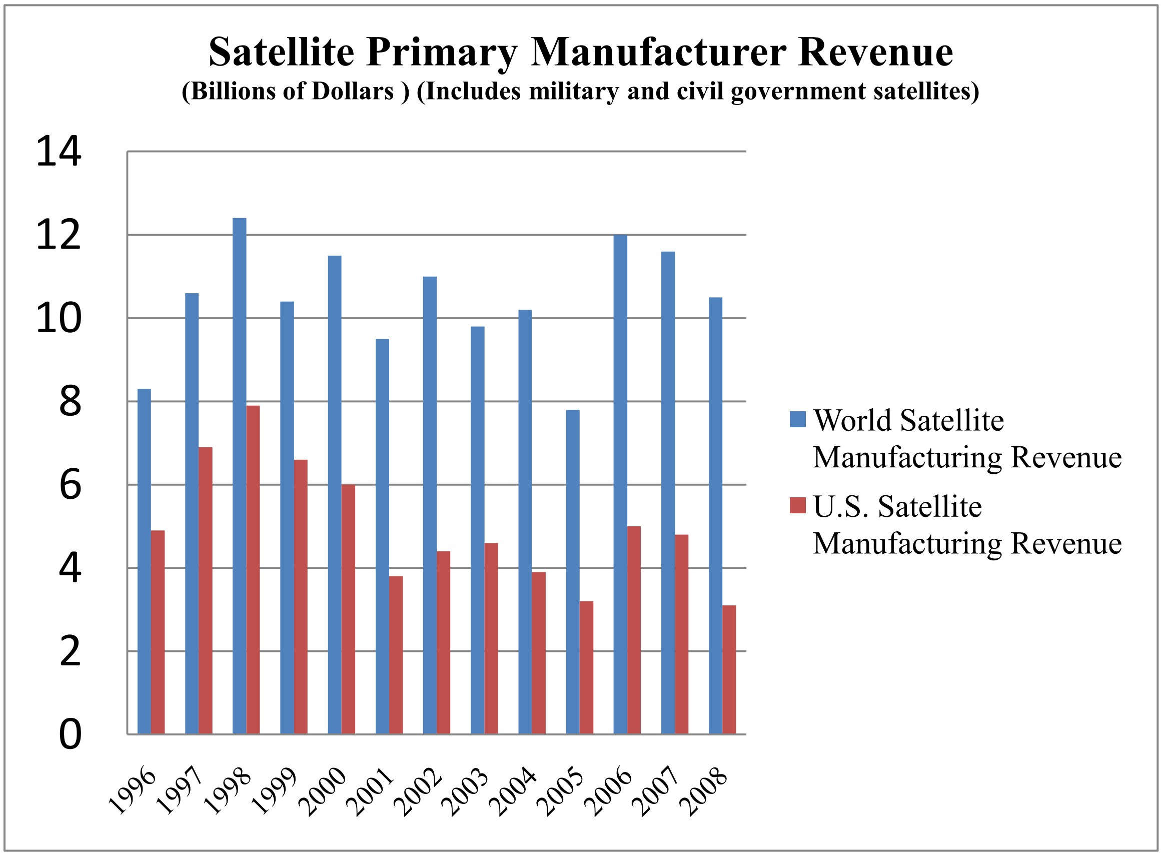
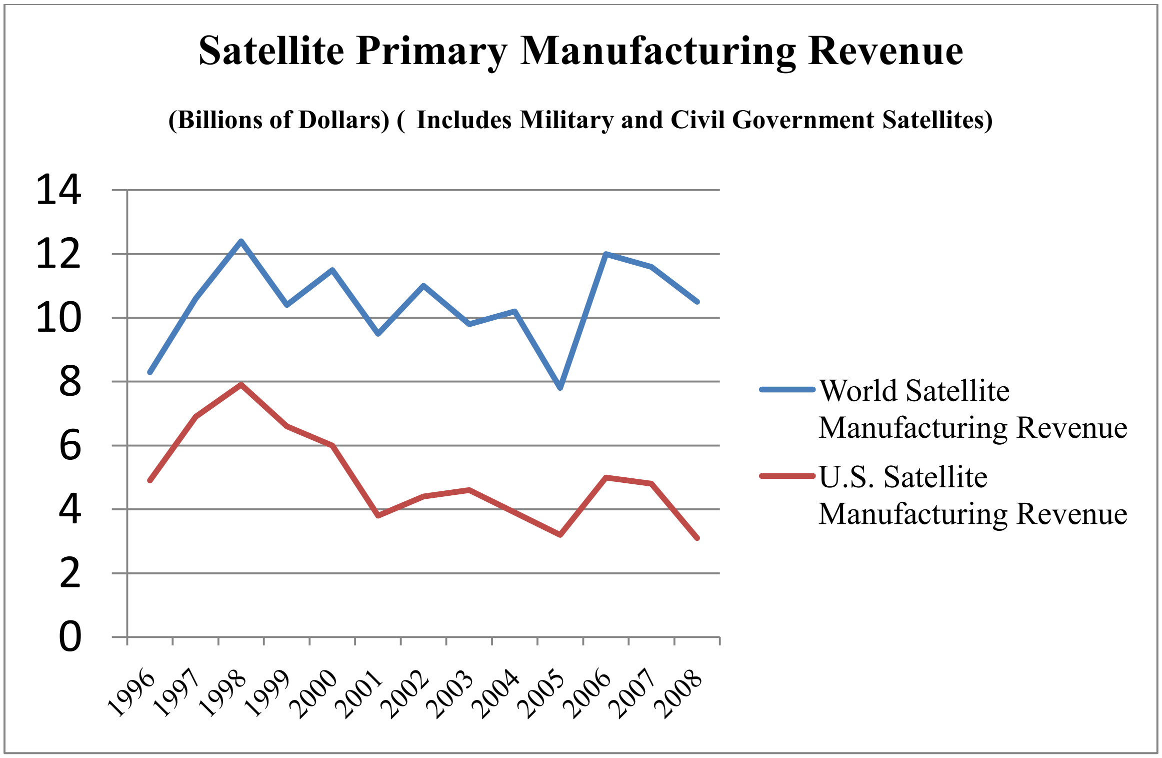
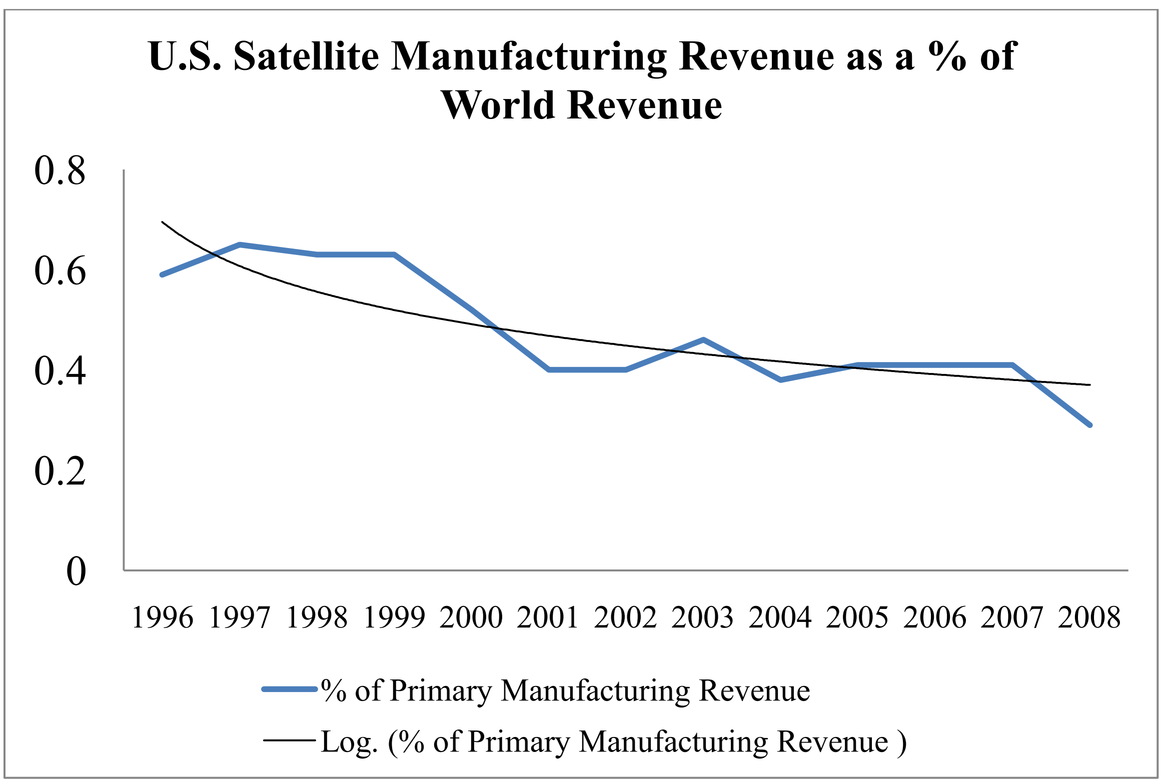
[309] *See* SIA Reports.

[310] *See* SIA Reports.



[311] Charts were created by Michael C. Mineiro on 16 February 2009. The data for these charts was derived from the 1996 – 2008 SIA Reports.


Satellite Primary Manufacturing Revenue
(Billions of Dollars) (Includes Military and Civil Government Satellites)
14
12
10
8
6
4
2
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
World Satellite Manufacturing Revenue
U.S. Satellite Manufacturing Revenue


U.S. Satellite Manufacturing Revenue as a % of World Revenue
0.8
0.6
0.4
0.2
0
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008
% of Primary Manufacturing Revenue
Log. (% of Primary Manufacturing Revenue)

The claims of the SIA are that this data reflects the negative impact of the STDA mandatory ITAR licensing provisions on the U.S. satellite manufacturers' ability to compete internationally for competitive contracts.[312] But is this the case? Let's take a closer look at the SIA data.

Regarding the *global market trends*, the cyclical nature of the satellite industry is accurately reflected in the SIA data. First, satellites, like other capital intensive industries, often go through cyclical market demand periods. Service demand is cyclical because the demand for satellite services is often correlated to economic growth in a particular region (e.g. United States) or sector (e.g. mobile broadband). Manufacturing demand for Comsats is related to service market demands (e.g. the number of transponders demanded for lease from the market) and also to physical capital requirements. Consider that the operational life time of a Comsat is typically between 10-15 years. Replacing these satellites is required in order to maintain the current capacity of service. Increasing market capacity requires additional satellites.

Regarding the U.S. revenue trends, problems exist taking this data at face-value as conclusive evidence of negative impact from the STDA. Simply looking at these broad numbers fails to consider a number of other factors that may have contributed to the decline in relative U.S. market share.

-First, during the late 1990s the U.S. manufacturing sector received a revenue boost (estimated at $2.8 billion dollars) from two large civil satellites built for the U.S. government (Terra and Chandra X-ray observatory).[313]

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[312] *See* Patricia Cooper, *Written Testimony for Patricia Cooper- SIA President – Before the House Foreign Affairs Committee (HFAC) – subcommittee on Terrorism, Non-Proliferation, and Trade,* (Hearing on Export Controls and Satellites, 2 April 2009), available online at http://www.sia.org/PDF/HFAC-STNT_SIA_Written_Testimony__3_31_09_FINAL.pdf>. *See also*, *Hearing before the Subcommittee Terrorism, Non-Proliferation, and Trade* (Serial No.111-14, 2 April 2009).

[313] *See* Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-93.

-Second, during the late 1990s, the commercial satellite industry was experiencing extraordinary growth that resulted in an increased demand for satellites.[314] This "Comsat" bubble burst in the early 2000s and so did the demand for satellites.[315]

-Third, the SIA data begins in 1996 and this prohibits looking back before 1996 to determine if the late 90's was simply an anomaly in U.S. market share or a continuation of earlier trends.

-Fourth, the 1990s marked the beginning of a market re-orientation as between satellite manufacturing and service providers. A number of quasi-public service provider/satellite operators (Intelsat, Eutelsat, and Inmarsat) became private firms and a number of consolidations occurred (SES purchased Americom and Intelsat purchased PanAmSat).[316] As a result, manufacturers with ownership interests in these companies lost captured customers and now had to compete openly for a contract award.[317] The impact has been more significant for U.S. manufacturers. For example, Lockheed Martin had an ownership interest in Americom and Boeing had an ownership interest in PanAmSat. Both of these companies only purchased satellites from each manufacturer respectively. However since being sold, neither Lockheed nor Boeing have been able to fully retain their market share with these companies.[318] Contrast this to Eutelsat. Eutelsat

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[314] *See* "Satellite Executives look ahead to a booming New Year" *Mobile Satellite News* (11 January 1996) pg.1.

[315] *See* Christopher Price, "Falling Prices Hit Operators: Telecommunication Satellites" *Financial Times* (London, UK: 10th December 1999) at 2. *See* "Short-Term Prospects for Financing Are Bleak" *Satellite News* (16 September 2002) Vol. 25, Issue 35, pg.1. "*Satellite industry* analysts and top executives agreed that the overall global economic slowdown and telecom *bubble* burst has had a deep and dramatic impact on companies offering communications satellite services and products. Attendees at the annual World Summit on Satellite Financing held here in early September were left to draw their consolation from the facts that, as one speaker put it, "satellites are here to stay and bad times always come to an end." *See also*, "Loral Fallout Tops 2003 stories" *Satellite News* (22 December 2003) Vol. 26, Issue 48, pg.1. "The war in Iraq spurred use of satellite capacity by the U.S. military and broadcasters worldwide. However, that increased demand was insufficient to compensate for an overall sluggishness in demand for satellite capacity."

[316] Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007) at 228.

[317] Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007) at 228.

[318] Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007) at 228.

is no longer bound to award all contracts to E.U. manufacturers, but has continued to do so.[319]

-Fifth, while Europe has been competing with U.S. manufacturing on the commercial satellite market since the 1980s, it was not until the late 1990s that European manufacturers began to offer technically competitive satellites.[320] Since 2001, U.S. and E.U. GEO Comsat performance have been similar across the three metrics of average satellite power, average expected lifetime, and average number of transponders per satellite.[321]

-Sixth, during the late 1990s, two major LEO/MEO Comsat constellations, with a total of 110 satellites, were launched.[322] This surge in LEO/MEO Comsat manufacturing should have contributed to a bump in revenue during these years.[323]

Most importantly, the SIA data fails to distinguish between overall revenue and export revenue. It is possible that U.S. export revenue has maintained, declined, or improved relative to foreign competitors, but the SIA data cannot definitively conclude. While the high correlation between Comsats and commercial satellite revenues allows for

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[319] Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007) at 228.

[320] *See* Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-56 and A-67. "European capabilities and presence have grown since mid-1990s". "U.S. and European Satellite Buses are comparable" and "US and EU primes have offered similar GEO bus models since at least 1998." *See also* Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007) at 230-231.

[321] *See* Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-68. *Also see* Ryan Zelnio, "Whose jurisdiction over the US commercial satellite industry? Factors affecting international security and competition" 23(4) Space Policy 221-233 (2007) at 230-231.

[322] Globstar has a 46-satelltie constellation, thirty eight of which were launched between 1998 and 2000. *See* Peter B. Selding, "Globalstar's 2nd-generation System Slated to Begin Launching this Fall" *Space News* (Vol.21, Issue 5, 1 February 2010). Iridium has a 66 satellite constellation that was launched between 1997-2002. *See Manual for ICAO Aeronatuical Mobile Satellite Services Part-2 Iridium Draft 4.0* (21 March 2007) at 2, available online at <http://www.icao.int/anb/panels/acp/wg/m/iridium_swg/ird-08/ird-swg08-ip05%20-%20ams%28r%29s%20manual%20part%20ii%20v4.0.pdf>. *See also Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 10.

[323] *See Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 10.

quantitative *export data* on commercial satellite prime manufacturers (generally) to be considered analogous to Comsat manufacturing (specifically),[324] the SIA data is not *export data,* it is simply revenue data.

Is it possible to get more specific data on the commercial satellite sector in order to determine conclusively whether the STDA has had an impact on its international performance and competitiveness?

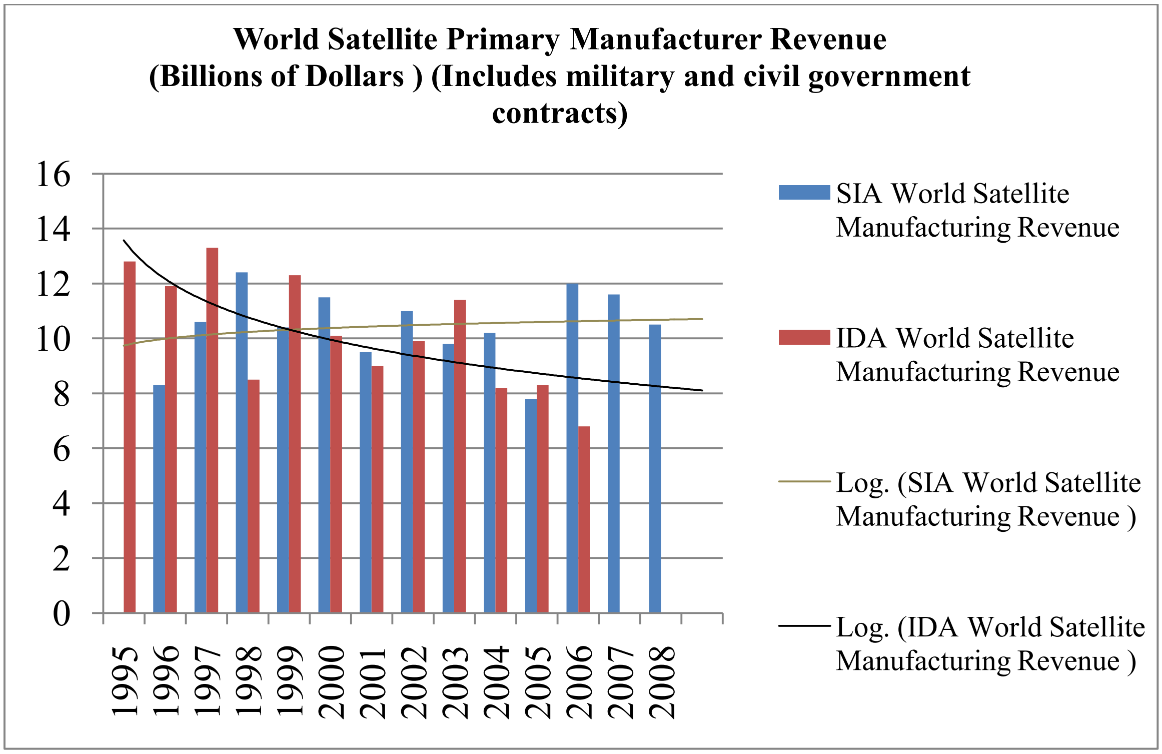
IDA data is able to assist as it provides more detail than the SIA Report. Under the IDA data, general revenue figures were broken down between civil, military, commercial GEO, and non-GEO commercial satellites.[325] This is more useful to determine the claims of causality between the STDA and declining U.S. Comsat market share. But before looking at these breakdowns, conflicting revenue estimates between the SIA and IDA report need to be mentioned.

The IDA and SIA estimates of satellite prime manufacturer (Global and U.S.) revenue follow similar trend lines. A strong correlation exists between IDA and SIA estimates of U.S. annual revenue, with the exception that the IDA estimated more U.S. revenue in 1999 ($2 Billion), 1998 ($1 Billion) and 1997 ($1 Billion). But there are several important distinctions between these reports. First, IDA estimates show, on average, higher total market share for U.S. manufacturers. Second, for 1998 the SIA reported an estimate of $12 Billion in global revenue and $8 Billion in U.S. revenue. The IDA estimates $8 Billion in total revenue and $5 Billion in 1998 U.S. revenue. Third, in 2003 and 2005 estimates, the SIA estimated $2 Billion (~20%) more revenues for the global sector then the IDA. Fourth, the IDA data terminates in 2006. In 2007-2009, the satellite industry experienced a cyclical upswing. As a result, SIA data (which includes

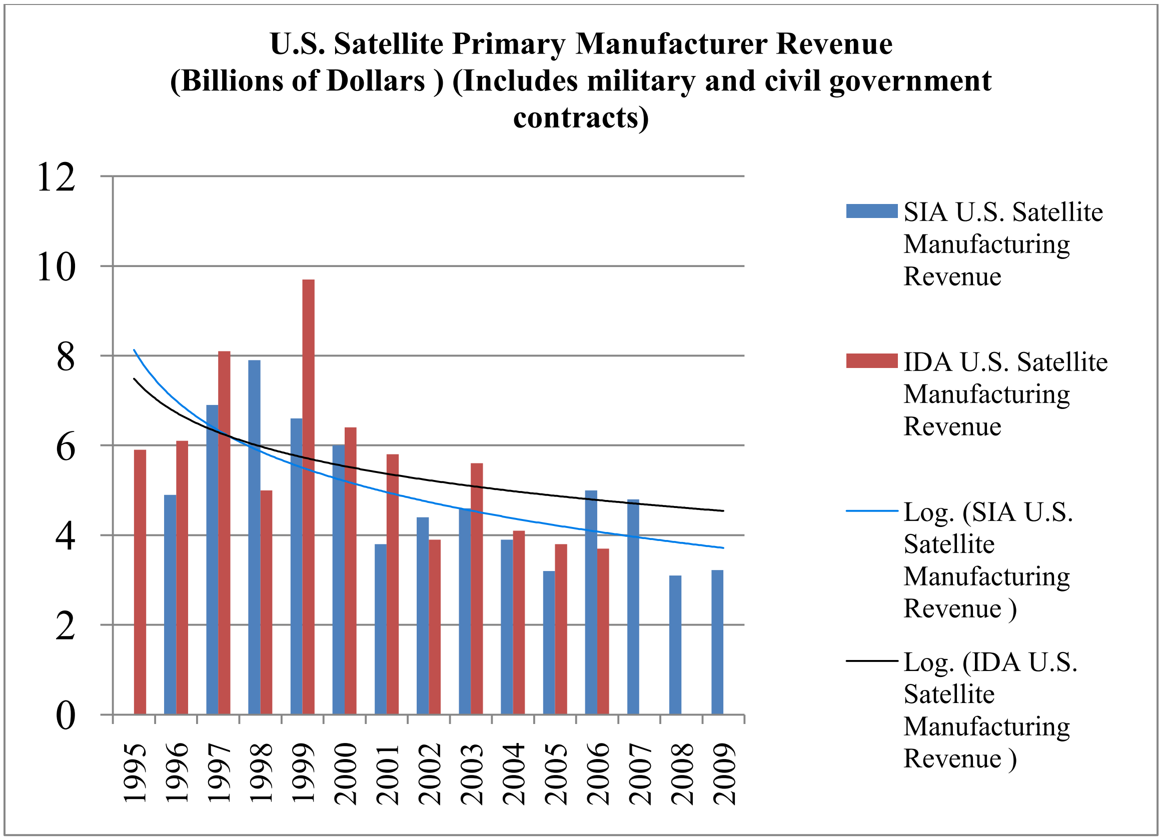
[324] *See* Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-34.

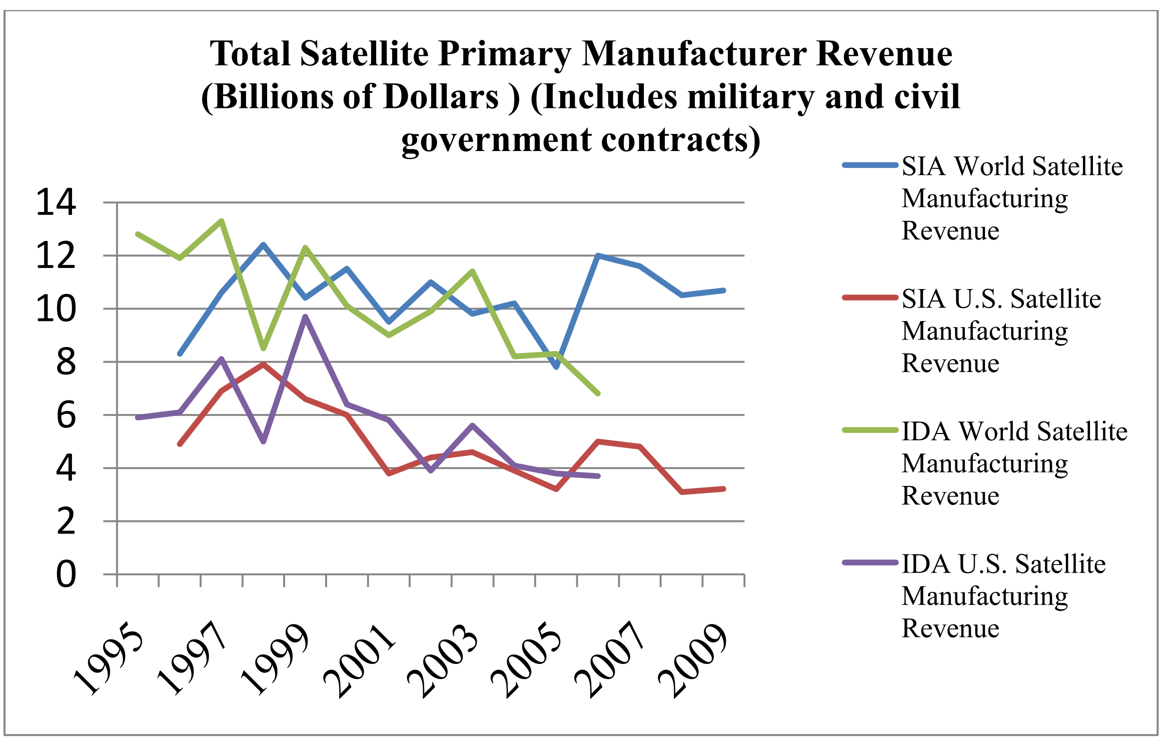
[325] Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-93.

2007-09) shows a higher logarithmic trend line for global revenue. The following charts illustrate this trend:[326]



[326] These charts were created by the author, Michael C. Mineiro, on February 18th, 2010, using data from the SIA and IDA Reports.


U.S. Satellite Primary Manufacturer Revenue (Billions of Dollars) (Includes military and civil government contracts)
12
10
8
6
4
2
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
SIA U.S. Satellite Manufacturing Revenue
IDA U.S. Satellite Manufacturing Revenue
Log. (SIA U.S. Satellite Manufacturing Revenue)
Log. (IDA U.S. Satellite Manufacturing Revenue)


Total Satellite Primary Manufacturer Revenue (Billions of Dollars) (Includes military and civil government contracts)
14
12
10
8
6
4
2
0
1995
1997
1999
2001
2003
2005
2007
2009
SIA World Satellite Manufacturing Revenue
SIA U.S. Satellite Manufacturing Revenue
IDA World Satellite Manufacturing Revenue
IDA U.S. Satellite Manufacturing Revenue

Each of these deviations taken alone does not change the general trend lines. But taken as a whole, the IDA data supports an interpretation that the drop in revenue following the STDA was partly attributed to an out-of-the-ordinary in terms of revenue gains for satellite manufacturers in 1997 and 1999. Comparing both SIA and IDA pre-1999 revenue data with post-1999 data, IDA data reflects a relatively more gradual decline with 2002-2004 declining at a lower rate as compared to SIA.

Returning to the examination of commercial manufacturing data, the IDA report statistics show that only approximately 50% of U.S. satellite prime manufacturing revenue derives from GEO or non-GEO commercial satellite sales.[327] This statistic supports observations on U.S. government military and civil funding, from which the U.S. space industrial base receives significant contracts. The IDA statistics also show that non-GEO revenue was virtually non-existent after 2001. This statistics correlates to the completion of several major LEO constellations during the late 1990s (e.g. Globalstar & Iridium). Today, GEO Comsats comprise almost 100% of the global satellite (prime) export market.[328] In the future, when LEO constellations are retired or new LEO constellations projects are funded, non-GEO revenue will once again be a factor.[329]

Regarding export revenue, on average from 1996-2006, U.S. prime manufacturers received approximately 50% of total GEO Comsat revenue from exports. The overall market was traditionally dominated by the U.S., but Europe has gained market share in recent years. Since the STDA, Europe has increased its GEO Comsat global market share from 19% to 28% and the U.S. has taken a corollary drop from 68% to 58%,

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[327] Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-93.

[328] Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-34.

[329] *See* Peter B. Selding, "Globalstar's 2nd-Generation System Slated to Begin Launching this Fall" *Space News* (Vol.21, Issue 5, 1 February 2010).

presumptively impacting U.S. export market share.[330] The exact numbers are illustrated below:[331]

Major Commercial GEO Manufacturers Global Market Share (1996-2006)

State of Corporate Registration	Manufacturer	Global Market Share 1995-1999	Global Market Share 1999-2006	Export Market Participant
U.S.	Boeing	31%	20%	Yes
U.S.	Lockheed	22%	17%	Yes
U.S.	Loral	14%	17%	Yes
U.S.	Orbital	1%	4%	Yes
E.U.	Thales Alenia	11%	16%	Yes
E.U.	EADS	8%	12%	Yes
Russia	NPO Prikladnoi Mekhaniki	5%	8%	No
India	ISRO	1%	1%	No
China*	CASC	-	-	-

*China has a GEO Comsat prime manufacturer that since 2006 has actively participated in the international export market. Unfortunately, this data was not available from the IDA report.

Perhaps most revealing is the IDA data of major GEO Comsat projects. Under this data set, all major GEO Comsat projects (defined as four or more satellites ordered) are assessed from 1990-1999 and then 1999-2008 (scheduled launch dates in 07' and 08') to see if customers switched from U.S. prime manufacturers after the STDA mandatory

330 Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-38.

331 These charts were created by the author, Michael C. Mineiro, on February 18th, 2010, using data from the IDA Report.

USML listing went into effect.[332] An analysis of the IDA market data reveals the following:

1) Non-Competitive Markets: No changes occurred in the captive U.S. market (Asiasat, BSAT, DirecTV, Echostar, Loral Skynet, New Skies, XM) and captive foreign markets (Arabsat, Eutelsat, Express, Insat).
2) Pre-STDA Competitive Markets: In Pre-STDA competitive markets, five customers awarded contracts to both U.S. and E.U. manufactures before the STDA (Chinasat, Inmarsat, JCSat, Panamsat, SES Americom). Since 1999, Chinasat has not awarded any U.S. contracts (this is explained by the U.S. export embargo), Inmarsat has not awarded, JCSat has only awarded U.S. contracts, and Panamsat has predominately awarded U.S. contracts.
3) Post-STDA Competitive Markets: Four customers (Apstar, Intelsat, SES Astra, and Telesat Canada) who prior to 1999 had only awarded U.S. contracts, began to award E.U. contracts after 1999. Intelsat is still a U.S. preference company, Apstar and SES Astra split their contracts, and Telesat will no longer award U.S. contracts.

These findings establish that captured markets tend to stay with their respective manufacturers, regardless of the STDA U.S. export control modifications. However, after the STDA, four previously "non-competitive" U.S. markets opened up to European competitors after 1999. While this does not conclusively link the STDA decision to the opening up of all four of these markets, it is strong evidence.

Canada is one of the four markets that shifted from non-competitive to competitive. Secondary qualitative evidence strongly suggests that U.S. ITARs were the primary reason for a post-1999 switch from U.S. to European manufacturers by the Canadian Company Telesat. Prior to 1999, Telesat bought fifteen satellites from U.S. vendors, but since 1999 Telesat has only acquired their satellites from European

[332] Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-40.

vendors.[333] In a 2003 interview with Aviation Week & Space Technology, the CEO of Telesat raised the issue of ITAR, in particular the difficultly in receiving information on U.S. satellites due to licensing delays and/or restriction, to explain the shift from U.S. to European vendors.[334] As Canada is one of the few "competitive" international commercial satellite markets, losing Canadian business definitely negatively impacted U.S. manufacturers. Telesat is strong evidence that the listing of U.S. Comsats to the USML (and associated ITAR regime) has created a competitive disadvantage for U.S. satellite exporters against their European competitors.

ii. Market Share of 2nd and 3rd Tier Companies

There is no public quantitative data upon which to assess the international market share of U.S. 2nd and 3rd tier SQUIPE manufacturers (spacecraft, space qualified items, associated propulsion and space related equipment). This lack of data is most likely due to the complexity of measuring market share, combined with a failure in the government, business, and academic communities to prioritize and fund a program to generate a database that would facilitate 2nd and 3rd tier economic analysis.

However, even with this deficiency of market share quantitative data, qualitative data and the NSSO-SIBA survey strongly support the conclusion that 2nd and the 3rd tier manufacturers carry a significant economic burden with regards to ITARs and the STDA.[335] This is because prior to the STDA, U.S. 2nd and 3rd tier manufacturers were actively engaged in the European satellite market, contributing components and subcomponents to European satellite projects. Indeed, it was these component and subcomponents that established the jurisdictional basis for the exercise of U.S. ITARs over European (and other foreign) satellites. Since that time, in part due to the STDA, and

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[333] Richard Van Atta Ed., *Export Controls and the U.S. Defense Industrial Base,* (Institute of Defense Analysis, Alexandria, V.A.: January 2007) at A-3.

[334] M. Taverna & D. Barrie, "Sea of Red Tape", *Aviation Week & Space Technology* (26 May 2003) at 72. Telesat CEO Larry Boisvert is quoted as saying that "The ITAR situation varies somewhat depending on the U.S. contractor involved — better at Lockheed Martin, worse at Boeing — but on balance the situation is getting worse," and that "Without access to information, it will be hard to buy U.S.."

[335] *See Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007).

in part due to self-interest, Europe has actively sought to divest itself of U.S. 2nd and 3rd tier components (the "ITAR" free movement). As a result, 2nd and 3rd tier manufacturers must have lost significant European market share – and Europe is the largest market outside of the United States. As discussed *supra*, 1st tier manufacturers have experienced a decline in international market share – in part attributable to the STDA/ITARs and in part to other reasons. But 1st tier manufacturers also have captured markets (both commercial and non-commercial). These captured markets provide some protection against complete market erosion. 2nd and 3rd tier manufacturers do not have this "captured markets" protection, either in the U.S. or abroad. With regards to the U.S. market, it is reported that to compete against the EU "ITAR-Free" strategy and other competitors, both U.S. and foreign companies have altered their business operations – in some cases to the detriment of U.S. suppliers - purchasing from foreign vendors because heritage and/or a looser regulatory environment.[336]

iii. Lost Sales

U.S. companies (of all tiers) have reported that ITAR export licensing requirements are a pivotal factor in making competition more difficult.[337] Lost sales attributed to the ITAR licensing process are estimated at an average of $588 million annually, representing about 1% of total U.S. space industry revenues.[338] However, telecommunication services generate the majority of space industry revenue (at 61% of domestic sales and 76% of foreign sales while spacecraft and components are only 21% of U.S. sales and 13% of foreign sales).[339] Because commercial Comsat services generally do not trigger ITAR restrictions, it is appropriate to presume that as a proportion of lost sales, manufacturer loss is higher than 1% of their revenue.

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[336] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 37.

[337] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 14.

[338] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 34.

[339] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 34.

iv. Compliance Costs

Self-reported data from U.S. companies shows an increase in the annual financial costs of complying with export controls since the STDA was enacted, with salaries and outside legal costs comprising the majority of cost.[340] Between 2003 and 2006, costs averaged at $49 million per year (industry wide) and increased 37% across all tiers.[341] The increase in salaries and legal costs correlates to the real-world operations of space exporting companies. Since the STDA, companies have implemented internal export compliance programs, with larger companies hiring salaried compliance officers full-time. They have also sought more outside legal counsel to assist in ITAR licensing and compliance.

Interestingly, 2nd and 3rd tiers reported significantly higher costs as a percentage of gross sales. On average, the financial costs for export control compliance for 1st tier companies is 1%, but for 2nd tier companies is 2% and for 3rd tier it rises to 8%.[342] This indicates that smaller companies (in the 2nd and 3rd tier) are unable to benefit from the economies of scale that 1st tier companies can with regards to export control costs. Likewise, it also indicates that 2nd and 3rd tier companies have a more substantial burden of compliance when competing in the international marketplace.

v. Restrictions on Global Operations

In addition to quantitative economic measures, restrictions on U.S. manufacturers' ability to utilize the benefits of economic globalization need to be considered. The ability of the U.S. space industrial base to fully avail itself to the benefits of globalization, while more difficult to quantify than the aforementioned metrics, is perhaps the most important impact of the STDA.

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[340] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 36.

[341] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 36.

[342] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 36.

This is because globalized operations have the potential to provide synergies and economies of scale that far surpass the resources and market demand of the United States. These synergies are developed in the economic and innovation apparatus of companies that are able to develop new technologies and manufacture goods on a global scale. These synergies are hindered by barriers to the free movement of goods, people, and ideas. Export controls, as currently conceived and implemented, are trade barriers and hence, to some extent, will retard global operations, "limit[ing] access to foreign components, intellectual capital, and the foreign national workforce"[343]

The decision to mandate all satellites to the ITAR regime, regardless of their foreign availability or technical characteristics, has meant that U.S. companies are subject to trade barriers that, when compared to overseas competitors, are discriminatory and comparatively limit the ability of U.S. companies to fully avail themselves of the benefits of economic globalization. Unlike the EAR regime and the European dual-use control counterparts, ITAR does not take into consideration the economic impact of control. No credence is given to foreign availability or de minimis content. Communicating with potential purchasers, or even current clients, requires specialized licenses under ITAR.[344]

Foreign national employees, a great potential reservoir of human ingenuity, require export licenses to work on ITAR projects, even if that project is in the United States. Legal 'firewalls' are built to comply with the ITAR mandate, often adding delay and cost, and retarding the ability of a company's human network of employees and customers to communicate. In personal conversations (undertaken by the author of this thesis) with engineers and employees of aerospace companies, time and time again the issue of ITARs came up as a barrier to international collaboration, not only as between companies, but also *within a particular company*. A French employee of a U.S. aerospace company once explained how he could not participate on a project because the subject matter was deemed subject to ITAR and licenses were difficult to obtain. This was true,

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[343] *Defense Industrial Base Assessment: U.S. Space Industry* (U.S. National Security Space Office, 31 August 2007) at 48.

[344] *See* Chapter 4 of this thesis.

even though the French employee was an engineer that wrote a doctoral thesis on the subject matter.

As discussed *supra,* the regulatory divergence between the U.S. and E.U. results in a loss of international market share attributed to customer preference for goods not subject to ITAR. But because the commercial satellite industry operates within the paradigm of economic globalization and the impact of restrictions on globalized economic activity on the industry is multifaceted, it also manifests itself in more subtle ways. For example, a company that participates in global markets increases its accessible market. It is potentially able to reach more customers and generate more revenue, likely increasing its ROA (return on assets). Larger revenues result in greater gross IRDI (individual research development investment), even if the percentage of revenue expended on IRDI remains the same. As a result, the company should be able to develop new technology and offer new products to the market faster than its competitors that are unable to fully avail themselves of the global marketplace.

<u>Hypothetical Example of Two Companies with Globalized Market Share and R & D Reinvestment</u>

	Year	Export Control Barriers	Accessible Markets	% of Market as Revenue	Gross Revenue	R + D Investment as % of Gross Revenue	Total R& D Expenditures
Company 1	2010	High	$5 Billion	75%	$3.75 B	1%	$37.5 M
Company 2	2010	Low	$10 Billion	50%	$5 B	1%	$50 M
Company 1	2020	High	$5 Billion	65%	$3.25 B	1%	$32.5 M
Company 2	2020	Low	$10 Billion	60%	$6 B	1%	$60 M

As the following chart illustrates, if the only factors to market demand were (a) export control barriers and (2) the level of technology, and assuming both companies had comparative technology in 1999 and were not able to adjust R +D expenditures, it would only be a matter of time before Company 2 overtook Company 1 and captured all competitive markets. Over time the company with lower regulatory barriers should be able to (1) access more markets, (2) increase gross revenue, (3) and out-spend a competitor in R & D.

In reality, the situation is much more complex and this assumption of only two market share factors is too simplistic. Nonetheless, the issue of R&D efficiency is still a real world problem. U.S. companies will face increasingly sophisticated foreign technology unless indigenous U.S. technology can be developed to compete. If the U.S. continues to lose market share, maintaining a technological edge will require either greater percentages of gross revenues as reinvestment for R & D *or* greater GRDI (government research and development investment, e.g. tax payer subsidized R &D).

Beyond the impact of export controls on a particular State or its company to participate in the globalized economy, export controls also raise the moral question of collective efficiency. Consider that export controls always cause a loss of efficiency because additional resources (financial, time, human, etc.) must be expended to comply and enforce the control; the more stringent the controls, the higher the costs. From a global human perspective, these restrictions on exports holistically form a shared cost that represent an expenditure of resources that could have been used to develop other aspects of the human society - - e.g. a negative externality for the entire human species. As will be discussed *infra,* while there are justified public policy reasons for imposing export controls (and other trade barriers), the question of legitimacy does not undermine the truth of this negative externality.

VI. Conclusions

Based on the aforementioned economic data and analysis, it is concluded that the STDA USML has negatively impacted the U.S. space industrial base, in particular satellite and component/subcomponent manufactures. This conclusion is supported by evidence of a declining market share of U.S. prime manufacturers, supplemented with qualitative and quantitative data that 2nd and 3rd tier manufacturers face increasing direct and indirect costs due to ITAR compliance, and increasing competition attributed to export control regulatory divergence between the U.S. and Europe.

Within the general discourse, the focus of economic analysis has been on the decline of U.S. market share, in particular the decline immediately following the enactment of the STDA (1999-2001). The conclusions reached in the discourse have been that this immediate decline signaled a linear causal relationship between the STDA and the drop in revenue share. However, this assumption is erroneous because it fails to consider three important facts that undermine the assumption of causality between the decline of the U.S. market share and the enactment of the STDA. First, the STDA went into effect in 1999 so it is extremely unlikely that the 1999-2001 drop in market share was significantly associated with the STDA. What is much more likely is that the revenue figures from 1997-1999 were anomalously high for the United States, and the drop from 1999-2001 was in part a market correction. Second, in 1999 European manufacturers were still very reliant on U.S. 2nd and 3rd tier component manufacturers. Indeed, this was the jurisdictional basis upon which the U.S. was able to establish ITAR licensing requirements on foreign satellites. Therefore, European satellites in the late 90s could not fully avail themselves of the advantages of "ITAR-Free" marketing. Third, satellites take several years from initial contract to delivery/launch, so the impact of the STDA would not be immediately reflected in annual revenue data.

Nonetheless, while the drop in U.S. market share immediately after the enactment of the STDA can be attributed to other causes (*supra)*, the steady decline in U.S. relative market share since then (2001-present) cannot be solely attributed to these alternative explanations. Instead, the logical conclusion is that the STDA is having an impact. What is unclear is the extent and exact nature of this impact.

With regard to U.S. competiveness, for certain the U.S. has been less successful in securing commercial satellite contracts on international competitive markets. How much is attributable to the STDA ITAR restrictions? That is difficult to quantify; but most likely this decline is attributed to both a weakening of U.S. competitiveness due to ITAR restrictions and a strengthening of European manufactures ability to compete.

The steady decline of U.S. market share also raises long-term concerns regarding secondary impacts of the STDA, such as restrictions on the ability of U.S. manufacturers to undertake global operations. It is hypothesized that these secondary impacts will negatively impact U.S. competitiveness and therefore pose a substantial threat to the national interests of the United States. The U.S. space industrial base, of which Comsat manufacturing is a significant portion, is a critical component of the national security and economic activity of the United States. As discussed in Chapter Two, Comsat technologies are closely associated with military and civil satellite technologies and, as a result, the U.S. military and civil sectors benefit from commercial manufacturing and associated research and development. Like an interconnected web, the economic success of the U.S. space industrial base results in gains for military and civil satellite programs. A degradation in the economic competiveness of the U.S. space industrial base is a degradation of the strength of the U.S. economy and its military industrial complex, and hence a weakening to the greater U.S. public national interest.

B. Economic Impact of the China Launch Boycott

As discussed in Chapter 4, the launch of satellites with U.S. origin technology on Chinese vehicles is prohibited *unless* the President waives the prohibition, on a case-by-case basis, on such grounds that a waiver is in U.S. national security interests. During the 1990s, a series of Presidential waivers was granted; but since the promulgation of the STDA, not a single waiver has been granted. In fact, the United States has a launch services boycott against China.

The economic effect of this boycott is not typically examined in the discourse. Indeed, there are no quantitative or qualitative studies that create or assess economic data associated with the boycott. Only ancillary notations to the boycott are referenced in most export control reform discussions. The reason for this variation/difference is that when compared to the launch boycott, the ITAR listing decision has had a more significant economic impact and also, as will be explained *infra* in subsequent Chapters, because revocation of the USML mandate carries less political risk than revocation of the launch boycott. But the relative economic significance of this boycott is going to change soon. The rationale for this prediction is based on market demands and the decline of foreign reliance on US technology.

I. Overview of Commercial Space Transportation

Transportation is the conveyance of people and goods from one location to another.[345] The mode of transportation includes the vehicle and associated facilities utilized in the conveyance. Every day we encounter different modes. Airplanes fly overhead, trucks carry goods on the highway, container ships ferry across the oceans, and trains roll down tracks that cross our cities and countryside. But there is another mode of transportation that we rarely see in our day-to-day lives.

Space transportation is a mode of transportation that relies on space launch vehicles to transport goods and persons to or through outer space. The associated

[345] *Black's Law Dictionary,* 8th ed., *s.v.* "transportation".

facilities for space transportation are spaceports and tracking-telemetry-and-control (TT&C) stations. Typically, the goods being delivered are spacecraft and, unlike other modes of transportation, rarely are the conveyances undertaken to deliver a good to a purchaser. Instead, the conveyance delivers an already purchased good to a location where it can be used (e.g. a transfer orbit in outer space). The technology of space transportation is primarily based upon expendable launch vehicles (ELVs). These vehicles are the “typical” vertical based launching systems most people are accustomed to seeing. However reusable (RLV) and partially reusable (PRLV) launch vehicles can also provide conveyance.

In the early days of the Cold-War, the United States and Soviet Union pursued the development of indigenous space launch vehicles and facilities capable of launching men and spacecraft into Earth orbit and beyond. Their development was not commercial. These government space transportation programs supported manned and unmanned missions for military, civilian, and political purposes. Based originally on heritage technology captured from Nazi-Germany aerospace programs, space launch vehicles quickly evolved in size and capability. The results were impressive; by the late-1960s government programs like *Apollo* were launching astronauts to the Moon. While these government programs of the 1960s still resonate in our memories, it was the development of communication satellites and the need to transport them to orbit that provided the critical catalyst for the *commercial* space transportation industry.

In the mid-1960s, the launch of the Early Bird communication satellite and the establishment of INTELSAT marked the beginning of a commercial communication satellite industry. At that time, the United States and Soviet Union held a virtual monopoly on space transportation services and spacecraft. Space transportation was a tool of foreign policy, and securing transportation services was at the discretion of these two space superpowers. Only government agencies or government contractors could provide transportation services. Spacecraft, launch vehicles, and associated technologies were only provided to close allies.

However, this monopoly on transportation services and spacecraft technologies was short-lived. Other States developed indigenous launch vehicles and spacecraft. The demand for transportation services increased as more space based applications and associated service providers came on line. By the late 1970s, the international market demand for space transportation was sufficient for the establishment of Arianespace, the world's first commercial space transportation company.[346] It has flourished since its founding, and is now driven largely by market demand for commercial communication satellite launch services. The 1980s marked a change in policy for the United States from government monopolization of space transportation to commercial market liberalization. In 1984, Congress enacted the *Commercial Space Launch Act*, legislation that established the regulatory framework for commercial space transportation services in the United States.[347] After the 1986 Challenger disaster, U.S. policies fully evolved to support the commercialization of U.S. launch service providers. By 1990, the U.S. had established a commercial launch service industry with multiple service providers.

Today commercial space transportation is an international multi-billion dollar industry. Commercial launches represent over 40% of global launch activity (e.g. representing 28 of 69 launches in 2007).[348] Commercial space transportation carriers provide conveyance for a variety of clients including private commercial actors, civilian government agencies, military agencies, and public research institutions. The United States, Europe, Russia, China, Japan, and India all have indigenous commercial launch service providers that sell transportation services on the international market. Overwhelmingly, the demand for commercial launch services is for commercial communication satellites, usually delivered to geosynchronous, but in some cases non-geosynchronous orbits. Remote sensing, imagery, weather, and scientific payloads complement the commercial communication satellite transportation market and evolving

[346] *See* Klaus Iserland, "Ten Years of Arianespace" (1990) 6(4) Space Policy 341.

[347] Commercial Space Launch Act of 1984 (as amended), Pub. L. No. 98-575, 49 U.S.C. § 70101 et seq. (2009). *See also*, Commercial Space Transportation Regulations, 14 C.F.R. §§ 401 et seq. (2009).

[348] *See* U.S., Federal Aviation Administration, *2009 Commercial Space Transportation Forecasts*, (Washington D.C.,: 2009), available online at: <http://www.faa.gov/about/office_org/headquarters_offices/ast/media/NGSO%20GSO%20Forecast%20June%203%202009%20lowres.pdf>.

transportation and spacecraft technologies also leave open the possibility of new markets developing for the space transportation industry.

II. Market Operations

To successfully operate within the international commercial launch market, a launch service provider must be able to meet the requirements of the satellite operator that is procuring the launch service. Not all satellites are technically similar. Their size, weight, and orbital destination change depending on the type and mission of a particular satellite. When selecting a launch vehicle, a satellite operator must take into consideration the launch vehicle's ability to convey a particular satellite, as well as other attributes such as price, reliability, placement accuracy, and availability.[349] The price of a vehicle will vary depending on relative supply and demand, as well its lifting and orbital capabilities.

III. Market Snapshot

To provide a quantitative context to the market, consider that in the year 2008 twenty-eight commercial launches occurred, with a total of forty-six commercial payloads (in some instances multiple spacecraft were launched on the same vehicle).[350] The majority of these commercial payloads are GEO-Comsats and these spacecraft are the most important commercial payload market in terms of revenue.[351]

In the GEO market, China, Europe, Japan, Russia and the United States have commercially viable Comsat launch services (with India working towards a heavy GEO lifter). Launch vehicle manufacturers and service providers from these countries (and a select number of cooperative international consortium countries) compete internationally

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[349] *See* Joel Greensberg, "Competiveness of Commercial Space Transportation Services" (1993) 9(3) Space Policy 220-232.

[350] *Commercial Space Transportation: 2008 Year in Review* (Federal Aviation Administration, January 2009), available online at the Federal Aviation Administration <http://www.faa.gov/about/office_org/headquarters_offices/ast/reports_studies/year_review/>.

[351] *Commercial Space Transportation: 2008 Year in Review* (Federal Aviation Administration, January 2009) at 11, available online at the Federal Aviation Administration <http://www.faa.gov/about/office_org/headquarters_offices/ast/reports_studies/year_review/>.

for competitive commercial contracts (e.g. non-government and non-captured market payloads), the majority of which are with Comsat operators.

From a Comsat operator perspective, if the technical capabilities (e.g. lifting-capacity, faring size, reliability) of competing launch vehicles are comparable; the choice of launch vehicles is determined by (1) price and (2) scheduling. Price is determined by a number of factors. Currency exchange, market demand, insurance rates, manufacturing costs, regulatory costs, and even government subsidies all play a role in pricing. Scheduling can be influenced by market demand, prioritization of payloads, and export controls.

Historically, pricing has been lower for Chinese launches as compared to U.S., European, and even Russian. During the 1980s and 1990s, Chinese launch services were viewed as a cheaper alternative to Western and Russian services. During this time, Chinese launches were sold at prices up to 65% below those of the Western competition.[352] To protect against Chinese competition, the United States entered into bilateral launch trade agreements, restricting the number and pricing of Chinese vehicles on the international commercial market.[353] These agreements fulfilled their purpose, and U.S. satellite manufacturers and their customers availed themselves of Chinese launch services until the enactment of the STDA.

Estimated International Market Launch Rates for GTO deliver in 1999[354]

Launch Vehicle Country/Region	Service Provider	Launch Vehicle	Pounds to GTO	Minimum Cost/lb to GTO	Maximum Cost/lb to GTO
China	CGWC	LM-2C	2200	$9091	$10714
China	CGWC	LM-2B	9900	$5051	$7071

352 Jay Lightfoot, "Competitive Pricing for Multiple Payload Launch Services: The Road to Commercial Space" (1994) 10(2) Space Policy 121.

353 *See* Peter Van Fenema, *The International Trade in Launch Services*, (Leiden Faculty of Law: 1999) at 183 – 240.

354 Barry D. Watts, The Military Use of Space: A Diagnostic Assessment (Center for Budgetary Assessment, Washington D.C.: 2001) at 143, available online at <www.CSBAonline.org>.

Europe	Arianespace	Ariane4	10900	$9174	$11468
Europe	Arianespace	Ariane5	15000	$10000	$12000
Russia	ILS	Proton	10150	$7389	$9360
United States	Boeing	Delta 2	4060	$11048	$13457
United States	Boeing	Delta 3	8400	$8929	$10714
United States	ILS	Atlas 2	8200	$10976	$12805
United States	Orbital	Taurus	1290	$13953	$15504
U.S. based International Group	Sea Launch	Sea Launch	11050	$6787	$8597

Today, the GEO Comsat launch market consists of four players: Arianespace (European Conglomerate), Sea Launch (U.S./Ukraine/Swedish Multinational), Russian launch service providers (marketed by overseas agent) and U.S. launch service providers (Space X, ULA). China is not a player because the STDA established a practical trade embargo against Chinese launch services. No U.S. satellites or foreign satellites with U.S. technology have been launched by China since 1998. But that embargo is under pressure. Eutelsat is scheduled to launch a GEO Comsat from China in 2011.[355] This launch will mark the first time since 1998 that a Western Comsat operator has launched with China.[356] Eutelsat is able to bypass the embargo because its communication satellite is being built with a Thales-Alenia platform free of U.S. components.[357]

IV. Conclusions as to the Economic Impact of the Launch Boycott

Eutelsat's action signals the beginning of what will become an increasing trend: for non-U.S. Comsat operators to preference cheaper and more easily scheduled Chinese

[355] Stephen Clark, "Eutelsat Swaps Rockets for Satellite Launch this Summer" *SpaceflightNow.Com* (19 February 2010), available online at: <http://spaceflightnow.com/news/n1002/19eutelsatw3b/>.

[356] Bruce Crumley, "China's Takeoff in the Space Industry" *Time* (12 March 2009) online: time.com <http://www.time.com/time/world/article/0,8599,1881966,00.html>.

[357] Stephen Clark, "Eutelsat Swaps Rockets for Satellite Launch this Summer" *SpaceflightNow.Com* (19 February 2010), available online at: <http://spaceflightnow.com/news/n1002/19eutelsatw3b/>.

vehicles. Launching on Chinese vehicles will provide Eutelsat with significant savings, estimated at 40% off the ~$100 million typical launch costs.[358] Comsat operators with an interest in availing themselves of the Chinese government will also receive political benefits by choosing Chinese launch service providers.

The U.S. will not be able to retard the entrance of China into the Western Comsat launch market because European manufacturers will avail themselves of the absence of European regulations boycotting dual-use Comsats from launch on Chinese vehicles. Both U.S. and European launch service providers can be expected to lose a portion of their market share to the Chinese.

In addition, ITAR-free satellite makers will gain a cost-competitive advantage over ITAR manufacturers. The cost of a satellite, from the perspective of a Comsat operator, is only one portion of overall asset costs: launch costs and insurance are the other major costs. If a Comsat operator can lower his launching costs, the ITAR-free manufacturer now has a competitive advantage roughly equivalent to these savings. So long as the Chinese vehicle has equivalent or near equivalent reliability and scheduling as compared to Western launch companies, the ITAR–free manufacturer will be able to utilize the cost-savings from Chinese launches to undercut ITAR manufacturers.

One can hypothesize that both European and U.S. launch manufacturers may lobby their respective political representatives for trade protection measures against Chinese vehicles priced significantly below the international market rates. It is also predictable that U.S. manufacturers will suffer declines in international competitiveness, placing additional pressure on the U.S. government to remove Comsats from the USML.

[358] Chris Forrester, "Eutelsat picks Chinese Launch" *RapidTVNews* (26 February 2009), available online at :< http://www.rapidtvnews.com/index.php/200902263244/eutelsat-picks-chinese-launch.html>.

C. Strategic Effectiveness of the STDA Comsat USML Mandate

The Congressional mandate that all satellites, regardless of their technological sophistication, foreign availability, or any other consideration, must be controlled as a munition and subject to ITAR, undermines the strategic effectiveness of the STDA. It is rational that a strategically effective Comsat export control system will have the legal mechanisms to distinguish between types and level of technology and consider the impact of controls on national economic interests.

The STDA imposes upon U.S. manufacturers comparatively more stringent export controls then their European competitors. This asymmetry was economically sustainable so long as foreign competitors relied on U.S. components and were subject to U.S. controls. But today European independence from U.S components means that U.S. manufacturers face increased economic costs even while comparative technology is available elsewhere on the international market as dual-use. In other words, ITAR restrictions work against the health of U.S. companies in global markets when foreign competitors do not face similar controls because the STDA USML mandate imposes economic costs on the U.S. space industrial base without compensating security benefits.[359]

An examination of the STDA reveals incongruence between the realities of strategic controls and its stated policy objectives. In fact, the following policy objectives illustrate the failed reasoning of the STDA and how the continuation of the USML, in light of the realities of Comsat technologies and trade, undermines U.S. national interests.

(I) Policy Objective #1: "*U.S. business interests must not be placed above U.S. national security interest*."[360] This policy objective reflects the rationale that the externalities of export control costs imposed on the U.S. space industrial base are not as important as national security interests. However this is a false choice. Business interests and national

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[359] James A. Lewis, *Preserving America's Strength in Satellite Technology* (CSIS Satellite Commission Report, Washington D.C.: April 2002) at 27.

[360] *Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511(1).

security interests are not necessarily distinct. Indeed, as discussed *supra*, the broadest conception of national security must encompass the strength of the U.S. military-industrial complex. As evidenced *supra*, the U.S. space industrial base is suffering from a loss of international competitive market share, a loss of sales, increased compliance costs, and restrictions on global operations. This, in turn, results in decreased capacity of the U.S. space industrial base to support R & D efforts absent subsidized government funds. By not properly recognizing that U.S. business interest's correlate with national security interests, the STDA has inadvertently undermined U.S. national security.

(II) Policy Objective #2: "*Exportation or transfer of advanced communication satellites and related technologies from the US to foreign recipients should not increase the risk to the national security of the United States*."[361] While this policy objective rightly attempts to distinguish between different levels of technology for the purposes of increasing the relevance of applicable controls, it fails to define advanced. In §1513(a) of the STDA, all Comsats are placed on the USML, regardless of their "advanced" state of technology. Indeed, even the most obsolete Comsat technology is subject to ITAR – a contradiction between this policy objective and the legal implementation mechanism. This objective also fails to distinguish between acceptable and unacceptable risk. There is always a risk (however small) that if you engage in international trade, the export or transfer of an item may one day go against the national security interests of the United States. It is therefore critical that a strategically effective export control recognize and distinguish between acceptable and unacceptable risks. The STDA fails to make this distinction.

(III) Policy Objective #3: "*Due to the military sensitivity of the technologies involved, it is in the national security interests of the United States that U.S. satellites and related items be subject to the same export controls that apply under U.S. law and practices to munitions*."[362] This objective correctly identifies the strategic importance of controlling goods and technologies as munitions that are of particular military sensitivity, but it fails to provide a definition (or metric of assessment) of the term 'military sensitive.' §1515(b)

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[361] *Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511(4).

[362] *Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511(5).

mandates that the term "military sensitive characteristics" includes "antijamming capability, antennas, crosslinks, baseband processing, encryption devices, radiation-hardened devices, propulsion systems, pointing accuracy, kick motors, and other such characteristics as specified by the Secretary of Defense." But these are technical examples of satellite capabilities, not qualitative standards of distinction as within particular technical capabilities. §1515 does not provide a concrete definition; it is an ambiguous term that does not assist in the task of distinguishing between levels of technological sophistication for the purpose of maximizing strategic benefit while minimizing the economic costs associated with trade restrictions. The STDA does not consider the possibility that some satellites and their associated technologies may *not be military sensitive*. Instead, all satellites are presumed, and indeed mandated to be regulated as, militarily sensitive. But the United States is the only Comsat manufacturing State to categorize all Comsats as militarily sensitive. Indeed, many U.S. Comsat technologies can be purchased on the open-international market from foreign suppliers as dual-use goods.

D. Strategic Effectiveness of the China Launch Boycott

The strategic goals of the China launch boycott are multifaceted, reflecting the evolution of law and policy from 1990 to today. In 1990, the initial strategic rationale for the China Launch Boycott was to impose pressure on China in light of the June 4th, 1989, Tiananmen Square incident.[363] But after the Cox Commission Report, Congress strengthened the boycott waiver requirements for Chinese launch services, essentially precluding Presidential discretion in lifting the boycott on a case-to-case basis. As a result, a new strategic rationale for the launch boycott was developed: (1) to protect and enhance the U.S. space launch industry[364] and (2) to prohibit the export of missile

[363] §902(b) of the Foreign Relations Authorization Act, Fiscal Years 1990 and 1991 (P.L. 101-246; 22 U.S.C. 2151 note).

[364] *Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511(7).

equipment or technology that would improve the missile or space launch capabilities of the PRC.[365]

As a trade protection measure, the boycott has been extremely effective. China has not launched a western commercial GEO Comsat since 1999 and its commercial launches have been limited to servicing its own international Comsat manufacturing contracts. However, the effectiveness of the boycott as a trade protection measure is threatened by European development of ITAR-Free Comsats. Just as with the STDA, the legal jurisdiction of the United States to impose the China launch boycott is predicated on foreign manufacturers including U.S. origin technologies on their Comsat. European development of indigenous ITAR-free substitute technology releases European manufacturers from the boycott. Eutelsat's recent decision to launch GEO Comsats from China signals the effective end of U.S. unilateral imposition of the boycott. Given the economic incentive for launching on the discounted Chinese launch vehicles, it is predicted that Eutelsat will be only the first of many non-U.S. Comsat service providers that will purchase Chinese launch services.

The return of China to the international launch market will create additional competition for the U.S. space launch industry, at least for internationally competitive contracts to launch non-U.S. origin technology satellites. But the U.S. space launch industry only launches a small share of non-U.S. satellites, so the immediate impact of China's entrance as a direct competitor will be minimal. Instead, it will be the additional competitive pressures imposed on the U.S. prime manufacturers that will present a greater issue. As discussed *supra*, non-U.S. primes whose Comsat can be launched on Chinese vehicles will have a competitive advantage over U.S. prime manufacturers because the cost-savings of Chinese launches will be calculated in the final purchasing decisions of Comsat operators. This competitive disadvantage will be world-wide and impact the traditional "captured" U.S. market because U.S. Comsat operators that

[365] *Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511(8).

purchase foreign Comsats can still avail themselves of cheaper Chinese launch services.[366]

The effectiveness of the boycott is questionable as a strategic tool to limit the export of missile equipment or technology that could improve the missile or space launch capabilities of the PRC. This is because launching a Comsat requires the exchange of technical data sufficient for the launch service providers to correctly integrate the Comsat as a payload on the launch vehicle, but it does not require technical exchange that will improve the launch vehicle. A typical export launch license approves the technical transfer of information related to satellite form, fit, function, mass, electrical, mechanical, dynamical/environmental, telemetry, safety, facility, launch pad access, and launch parameters, but other technical characteristics, such as encryption, guidance, and upper-stage propulsion are not necessary. [367] Prior to the STDA, the United States licensed the export of eight U.S. satellites to China for launch, supplemented with a U.S.-China Satellite Technology Safeguard Agreement. These eight launches were licensed because they were consistent with the public policy goal of prohibiting the export of missile equipment or technology that would improve the missile or space launch capabilities of the PRC.

The concern raised in the Cox Commission report, which is reflected in the STDA, is that during post-crash investigations with Chinese launch service providers U.S. satellite manufacturers violated U.S. export control regulations by transferring technical data without approval.[368] The unauthorized technical data exchanges may have

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[366] This is because the boycott is limited to export controls and does not prohibit U.S. licensed satellite operators with non-U.S. satellites from launching on Chinese vehicles (However, export control restrictions on launch may arise in the form of technical information exchange regarding post-launch Comsat operations *if* the operations involve U.S. origin 'technical knowledge.'). *See* §902(a)(5) of the Foreign Relations Authorization Act, Fiscal Years 1990 and 1991 (P.L. 101-246; 22 U.S.C. 2151 note). "Exports of any satellite of United States origin that is intended for launch from a launch vehicle owned by the People's republic of China shall remain suspended, unless the President makes a report under subsection (b) (1) or (2) of this section."

[367] M. May ed., *The Cox Committee Report: An Assessment* (CISAC, Stanford: 1999) at 92, available online at < http://fsi.stanford.edu/publications/cox_committee_report_the_an_assessment/>.

[368] *See Declassified Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China* (Submitted by Rep. Cox, U.S.G.P.O, Washington D.C. ; January 3rd, 1999 – declassified May 25th, 1999).

resulted in Chinese engineers more successfully resolving anomalies associated with launch vehicle failures and to the improvement of future launch vehicle designs. This is a valid concern, but not one that requires a boycott of Chinese launches. If U.S. manufacturers had followed export control regulation, no authorized transfers would have occurred. The possible transfer of missile and/or space launch vehicle technology to China is a result of failed self-policing and most likely ignorance on the part of U.S. nationals, not because U.S. satellites were exported to China for launch. If the real issue of technology transfer is in post-crash accident investigation, then isn't it more effective to simply strengthen the rules and enforcement of exported Comsat accident and anomaly investigation, as opposed to imposing a blanket prohibition against all exports for launch?

E. Chapter Summary & Conclusions

The STDA mandate that all Comsats must be controlled as munitions and subject to ITAR should be repealed and legislative reform instituted. The STDA has contributed to a decline in the competitiveness of the U.S. space manufacturing base, in particular its 2nd and 3rd tier companies, as reflected in the quantitative and qualitative data assessed *supra*. While perhaps the economic costs associated with this mandate were justifiable at the time of their imposition, since that time the development of European and Chinese indigenous Comsat technologies undermines the strategic effectiveness of the STDA mandate. Because of this availability of close substitute sources of supply, continuing to impose the STDA on Comsats will result in economic loss for the United States without producing a strategic benefit. For this reason the STDA should be reformed and/or repealed.

In the near future, China will be re-entering the international launch market, regardless of the U.S. launch boycott. Their re-entrance changes the international launch market by introducing a lower-cost competitor. The strategic effectiveness of this boycott is only limited to prohibiting satellites with U.S. origin from launch. As a result, the global Comsat market will prefer non-U.S. origin satellites because of the lower-costs and additional supply of Chinese vehicles. So long as the only competitor to U.S. launch services were comparatively priced European service providers, this boycott served its strategic purpose. But with China's return to the market, the strategic effectiveness of the boycott is no longer achieved and given the predicted future negative economic impact the boycott will have on the U.S. satellite manufacturing base, it should be reformed and/or revoked. As will be discussed in subsequent Chapters, alternative measures exist that can protect against unauthorized technology transfers without imposing the boycott.

Chapter VI

Efforts to Reform the STDA and China Launch Boycott: A Public Choice Theory Analysis

In previous Chapters, evidence was presented that both the STDA and the China Launch Boycott impose economic costs on the United States without a concomitant strategic benefit. It was concluded that these export control measures should be reformed and/or repealed, primarily because of "circumstances where, because of the availability of close substitute sources of supply, they are seemingly incapable of producing any beneficial consequences."[369] If the evidence and resulting conclusions in the preceding Chapters are accurate, then why has the United States not reformed and/or revoked these mandates? Is this an example of a government failure?

In this Chapter, the question of reform is examined through the lens of public choice theory. The reason public choice has been selected is that public choice theory, when applied to these specific cases, provides realistic explanations as to the legislative process that resulted in the STDA and China Launch Boycott. It is recognized that public choice theory has limitations and is not the only theoretical lens through which to assess these legislative acts. Limitations to public choice theory include the tautological presumption of individual self-interest, assumptions concerning the level of information possessed by a representative individual, maximization strategies of individuals, and most importantly, the implicit inclusion of a metric of efficiency as the proper standard for which to judge a government action.[370] But these limitations do not undermine the insights that are gained through the application of public choice theory for an explanation

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[369] Ronald Cass & John Haring, "Domestic Regulation and International Trade: Where's the Race? – Lesson from Telecommunications and Export Controls" in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 142.

[370] *See* Vincent Ostrom and ElinorOstrom, "Public Choice: A Different Approach to the Study of Public Administration" 31(2) Public Administration Review 203 (1971) at 205-206. *See also*, James M. Buchanan, "Public Choice: Politics without Romance" 19(3) Policy 13 (2003) at 16. *See also*, James M. Buchanan, "Politics without Romance: A Sketch of Positive Public Choice Theory and its Normative Implications" in, James M. Buchanan and Robert D. Tollison Eds., *The Theory of Public Choice – II*, (University of Michigan Press: 1984) at 11-23.

of the *causality* of export control reform failure and for the identification of *additional values* that should be considered in addition to the economic and strategic metrics discussed in previous Chapters.

Toward these ends, this Chapter provides a basic overview of public choice theory and thereafter applies three particular theories to the case-study of Comsat export controls.

A. Overview of Public Choice Theory

Public choice theory is a field of political science that applies the theories and methods of economics to the analysis of political behaviour [371] and offers an understanding of the complex institutional interactions that go on within the political sector.[372] Its academic origins developed from the study of economics and the need to understanding the mechanisms that guide resource allocation in the public sector of the economy.[373]

In the discourse of public choice theory and trade, a disjunction occurs between economic valuing and political valuing. [374] For economists, exports are good only so far as they make welfare-improving import possible. But for politicians, things are reversed and the basic rule of trade politics is that imports are bad because domestic producers face more pressure, but exports are good because domestic politicians tend to be

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371 William Shughart II, "Public Choice" in *The Concise Encyclopdia of Economics,* available online at <http://www.econlib.org/library/Enc/PublicChoice.html>.

372 *See* Ronald N. McKean, "The Un*See*n Hand in Government" 55(3) The American Economic Review 496 (1965). *See also*, James M. Buchanan, "Politics without Romance: A Sketch of Positive Public Choice Theory and its Normative Implications" in, James M. Buchanan and Robert D. Tollison Eds., *The Theory of Public Choice – II*, (University of Michigan Press: 1984) at 11-23.

373 Ronald N. McKean, "The Un*See*n Hand in Government" 55(3) The American Economic Review 496 (1965) a 496.

374 Ronald Cass & John Haring, "Domestic Regulation and International Trade: Where's the Race? – Lesson from Telecommunications and Export Controls" in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 141.

sympathetic to domestic producers.[375]As a result, the traditional model of public choice hypothesizes that the politics of trade is biased in favor of export producers of the good at issue because there is a "natural bias of public decision-making in favor of readily indentified, easily organized, groups of people intensely interested in an issue."[376] This bias arises because interest groups are able to concentrate their political influence to achieve beneficial regulatory outcomes. In other words, they can successfully lobby the government. According to this theory, regulation that provides gains to a broad, diffuse, unorganized populace while imposing losses to a select few producers is antithetical to the natural bias.[377]

If one applies this theory of public choice to current U.S. Comsat export controls, the predication is that the satellite industrial base should have successfully lobbied Congress to repeal the Strom Thurmond Defense Act and China Launch Boycott. In fact, the satellite industry has attempted but has failed to repeal these Comsat controls, and not from want of effort. The primary association for the satellite industry (The Satellite Industry Association (SIA)) has a very active lobbying effort on Capitol Hill to revoke the STDA.[378] As early as 2000, the satellite industry was publicly advocating for the revocation of the STDA.[379] Since that time, the satellite industry, through the SIA and other public relations efforts, has successfully promoted public discourse that is in large

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[375] Ronald Cass & John Haring, "Domestic Regulation and International Trade: Where's the Race? – Lesson from Telecommunications and Export Controls" in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 141.

[376] Ronald Cass & John Haring, "Domestic Regulation and International Trade: Where's the Race? – Lesson from Telecommunications and Export Controls" in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 142.

[377] *See* Ronald Cass & John Haring, "Domestic Regulation and International Trade: Where's the Race? – Lesson from Telecommunications and Export Controls" in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 142.

[378] *See* Satellite Industry Association Website < http://www.sia.org/index.html>. *See* SIA Testimony before the House Foreign Affairs Committee – Subcommittee on Terrorism, Non-Proliferation and Trade, Hearing on Export Controls on Satellite Technology (April 2, 2009).

[379] *See* Satellite Industry Association Press Release, "Rep. Berman and Rep. Rohrabacher introduce bill to strengthen competitiveness of U.S. satellite industry" (May 4th, 2001), available online at < http://www.spaceref.com/news/viewpr.html?pid=4748>.

part supported by or biased towards their views.[380] But with ten years of concerted effort the SIA has failed to achieve regulatory reform.

The Launch Boycott is not such a clear cut case of asymmetric costs, as the boycott has provided an economic benefit to the U.S. domestic launch industry by acting as a trade protectionist measure. However, this benefit is now undermined by the return of China to the international launch market.

Given the active lobbying efforts of the satellite industry and the ever increasingly regulatory divergence with Europe, why has Congress failed to repeal and/or reform these legislative acts? Or are there other factors to consider? These questions are especially pertinent given the decreasing strategic effectiveness of these export controls (as assessed in Chapter 5).

B. Application of Public Choice Theories

In the following section, the public choice Cost-Value, the Recalibrated Cost, and Inefficient Government theory are applied with the goal of gaining insight on this question.

I. Recalibrating Value and Cost Theory

According to the Recalibration-Cost Theory, "both the value and cost of export control might differ from what appears at first blush"[381] and "the apparent misfit between

[380] I have read hundreds of articles on this subject and almost invariable they present a perspective favorable to the industry position of export control reform. For an example of the talking points promoted by the satellite industry, please *See* Aerospace Industry Association COMSAT talking points, available online at: <http://www.aia-aerospace.org/assets/talking_points_8_07_09_comsats.pdf>. *See also* Mike Gold, "Lost in Space: A practitioner's First-Hand Perspective on Reforming the U.S.'s Obsolete, Arrogant, and Counterproductive Export Control Regime for Space-Related Systems and Technologies" 34(1) Journal of Space Law at 163 (2008). *See also* P.J. Blount, "The ITAR Treaty and its implications for U.S. space exploration policy" 73 Journal of Air Law and Commerce 705 (2008).

[381] Ronald Cass & John Haring, "Domestic Regulation and International Trade: Where's the Race? – Lesson from Telecommunications and Export Controls" in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 143.

[Comsat] export controls and public choice theory disappears upon examination."[382] A case-study of STDA and China Boycott controls reveals that four additional values [benefits] can be readily identified: denial, delay, cost-raising, and signaling, but that these additional values are undermined by European regulatory divergence and the development of Chinese indigenous technology.

Denial is the most obvious benefit of these Comsat export controls. China and other nations may be denied Comsats for either sale or launch. However, the failure of the U.S. to achieve regulatory convergence with Europe means that the U.S. lacks the ability to continue to deny China and others access to Comsats of comparable technical sophistication for either sale or launch.[383] As Cass & Haring point out, "On its face, these instances seem to be all cost, no benefit government actions. Even for the most skeptical observes of government that is an implausible paradigm."[384]

Delay seeks to "maintain some temporal advantage in access to the restricted good."[385] The U.S. controls against China have achieved this goal. From 1998 until 2010, no Western Comsats were launched from China.[386] Also, China has not purchased a sophisticated Western satellite with U.S. technology since 1998. However, this delaying tactic is not sustainable. Europe is now launching ITAR free Comsat on Chinese launch vehicles and selling China Comsats without U.S. origin technology.[387] Likewise, China's

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[382] Ronald Cass & John Haring, "Domestic Regulation and International Trade: Where's the Race? – Lesson from Telecommunications and Export Controls" in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 143.

[383] *See* Chapter 4 and Chapter 5 of this thesis.

[384] Ronald Cass & John Haring, "Domestic Regulation and International Trade: Where's the Race? – Lesson from Telecommunications and Export Controls" in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 143.

[385] Ronald Cass & John Haring, "Domestic Regulation and International Trade: Where's the Race? – Lesson from Telecommunications and Export Controls" in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 143.

[386] *See* Bruce Crumley, "China's Takeoff in the Space Industry" *Time* (12 March 2009) online: time.com

<http://www.time.com/time/world/article/0,8599,1881966,00.html>. *See also* Andy Pasztor, "China to Launch for France's Eutelsat" *Wall Street Journal* (25 February 2009) online: online.wsj.com <http://online.wsj.com/article/SB123550142763361701.html>.

[387] *See* Joan Johnson-Freese, "The Emerging China-EU Partnership: A Geo-Technological Balancer" 22(1) Space Policy 12 (2006). *See also*, Rep. Rohrabacher Press Release, "Rohrabacher Condemns European

indigenous Comsat technology has improved significantly and China is now selling Comsat on the international market.[388]

Cost-raising is another benefit. Export control raises the costs of acquiring a good. “Restrictions on export are likely to do this to some degree even if they are only partially successful, in part for the same reason that trade theorists generally favor multilateral liberalization and oppose reciprocal trade agreements: unimpeded, trade will tend to take its most efficient route, while constraints that apply differently to different sources or destination for trade, even if they cause minimal distortion in production, will cause, trade to be diverted to second best channels.”[389] For Comsats this is true, as costs are manifested within the licensing and monitoring system itself (e.g. time delays, licensing fees, uncertainty for re-export approval), outside of it (e.g. the commercial stigma of ITAR products), and Comsat trade has been diverted to second-best channels.

Export controls may possess political utility even if the other goals of control are not achieved. In this sense, export controls can serve as a political signal, letting “both domestic and foreign audiences know what [the exporting government] thinks of particular nations at particular times.”[390] Cass & Haring theorize that “signaling effect may be especially useful if it can be calibrated by the sort of goods in which trade is limited.”[391] Comsats fit well within this theory of calibration, in so much as Comsats are a particular high-technology aerospace associated product meant to signal to the Chinese and to other nations that ballistic missile and associated space technology proliferation is unfavorable.

Satellite Company’s use of Chinese Rockets Calls China “Weapons of Mass Destruction Proliferator”” (Washington D.C.: 25 February 2009), online: < http://www.spaceref.com/news/viewpr.html?pid=27637>.

[388] *See* Xinhua News Agency, “Bolivia set to buy Chinese telecom satellites” *China Daily* (9 September 2009), online: Chinadaily.com < http://www.chinadaily.com.cn/china/2009-09/25/content_8736008.htm>.

[389] Ronald Cass & John Haring, “Domestic Regulation and International Trade: Where’s the Race? – Lesson from Telecommunications and Export Controls” in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 144.

[390] Ronald Cass & John Haring, “Domestic Regulation and International Trade: Where’s the Race? – Lesson from Telecommunications and Export Controls” in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 144.

[391] *Id.*

II. Asymmetric Official Incentives Theory

The second hypothesis is that self-interested behavior of public officials, not serving broader public interests, produces a bias towards imposition of export regulation, even though the regulation imposes a real and serious cost.[392] This self-interest can derive from various sources: political constituents, concentrated harm to the individual deciding to regulate or not (e.g. risk of public scandal), etc.. The critical characteristic of this theory is that the public official is not serving the broader public interest.

The politics surrounding Comsat export controls do evidence some degree of self-interested behavior. Take for instance the boycott against lunching U.S. Comsats from China. At the time of Tiananmen Square (July 4th, 1989), the H.W. Bush administration initially instituted a measured response (on July 5th, 1989), including the prohibition of exporting weapons for sale, but not the prohibition of exporting Comsats for launch.[393] President Bush called for "reasoned, careful action that takes into account both our long-term interests and recognition of complex internal situation in China."[394] As events continued to unfold in China, public opinion in the United States demanded a stronger response. The Bush administration instituted a second series of sanctions (on July 20th, 1989), suspending high-level meetings and postponing Chinese loan application at the World Bank, but they did not include export prohibition for Comsat launches.[395]

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[392] *See* Ronald Cass & John Haring, "Domestic Regulation and International Trade: Where's the Race? – Lesson from Telecommunications and Export Controls" in Daniel Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 145.

[393] On June 5, 1989, President H.W. Bush announced the following U.S. actions: Suspension of all government-to-government sales and commercial exports of weapons; Suspension of visits between U.S. and Chinese military leaders; Sympathetic review of requests by Chinese students in the United States to extend their stay; Offer of humanitarian and medical assistance through the Red Cross to those injured during the assault; and- Review of other aspects of our bilateral relationship as events in China continue to unfold. "The President's News Conference: Suppression of Student Demonstrations in China," 25 Weekly Comp. Pres. Doc 839, 12 June 1989, cited in Col. Gerard A. St.Amand, "Schizophrenic Sanctioning: A Failed U.S. Policy Toward China" (National Defense University Report, 1994) online: < http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA444566&Location=U2&doc=GetTRDoc.pdf>.

[394] Press Release, "The President's News Conference: Suppression of Student Demonstrations in China," 25 Weekly Comp. Pres. Doc 839 (12 June 1989).

[395] Col. Gerard A. St.Amand, "Schizophrenic Sanctioning: A Failed U.S. Policy Toward China" (National Defense University Report, 1994) at 4, online: < http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA444566&Location=U2&doc=GetTRDoc.pdf>.

Congress was not satisfied and demanded that the Bush Administration “speak out more forcefully or impose tougher economic punishment,” but the Bush Administration did not.[396] The Administration calculated that while the current political climate in the U.S. called for harsher measures, U.S. response should be “calibrated to be harsh enough to undercut pressure from Congress for additional sanctions but not too harsh as to aggravate Beijing into a deep breech in the Chinese-American relationship.”[397] Congress then used the Foreign Relations Authorization Act of 1990-1991 to impose addition sanctions, including the boycott of U.S. satellites for launch by China.[398] It is certainly credible to conclude that public opinion in the United States was a consideration in the decision by Congress to boycott U.S. satellites. Such consideration would have included the self-interests of individual politicians to support sanctions against China commensurate with the public opinion of their electoral constituents.

The decision to enact the Strom Thurmond Defense Act Satellite Amendments of 1998 (mandating Comsats to the USML and increasing the standard for Comsat launch export under the Tiananmen Square Sanctions from “national interest” to “national security interest”) were also enacted at a time of political controversy. At that time, President Clinton was in the midst of a political controversy known as “Chinagate,” in which Justice Department uncovered evidence that representatives of the Chinese government sought to direct political contributions from foreign sources to the Democratic National Committee (DNC) during the President campaign of 1996.[399] One aspect of the investigation involved China Aerospace Science and Technology (CASC), whose commercial business includes launching Comsats. Johnny Chung, a large donor to the DNC who was eventually convicted of several felonies, testified under oath to the U.S. House Committee investigating him that he was given several hundred thousand

[396] David Hoffinan, "China Executions Push Bush to Focus on Future," *Washington Post* (25 June 1989) at A25.

[397] Thomas L. Friedman, "U.S. Suspends High-Level Links To China as Crackdown Goes On," *New York Times* (21 June 1989) at A8.

[398] *See* Chapter 4 of this Thesis. *See also*, §902 of the Foreign Relations Authorization Act, Fiscal Years 1990 and 1991 (P.L. 101-246; 22 U.S.C. 2151 note).

[399] Bob Woodard and Brian Duffy, "Chinese Embassy Role In Contributions Probed", *Washington Post* (13 February 1997) at A01.

dollars by way of an executive of CASC and told to donate it to Clinton's re-election campaign fund.[400] The Republication controlled Congress linked the alleged donations to the issue of national security and Comsat export controls and this linkage served as one justification for the STDA Amendment. It is reasonable to conclude that political self-interest on part of the Republican Congress played some role in this decision.

Political self-interest can explain, to some degree, the initial decisions to impose export controls, but does it explain the failure to achieve reform and/or repeal? Are there self-interests against reforming the current controls? Let us first examine the launch boycott associated with the Tiananmen Square incident. There are several political self-interests against revoking these sanctions, almost invariable associated with public perception of China as a strategic competitor.[401] For example, revoking the launch boycott could be viewed as politically "weak" on national security and there is the risk of risk of public scandal. Consider that China in 2008 successfully tested an anti-satellite kinetic kill vehicle that caused serious international contestation, the legality of which is subject to controversy.[402] If Congressional members support a lifting of the launch sanctions, they would be open to political attack (whether or not grounded in fact) that lifting of the boycott has assisted China in developing its military space and ballistic missile capability. Also, the U.S. domestic launch industry has an interest in maintaining the boycott – and specific Congressional members may be biased towards this constituency.[403] Another constituency that may be able to influence individual Congressional self-interest is the U.S.-Taiwan lobby, traditionally a power political force.[404] Combined, these political self-interests provide support to the theory that

[400] David Johnston, "Committee Told Of Beijing Cash For Democrats ", *New York Times* (12 May 1999) at A21.

[401] *See* Ester Pan, "The Scope of China's Military Threat" (Council on Foreign Relations: 2 June 2006), available online at *http://www.cfr.org/publication/10824/*>. *See also*, "Annual Report to Congress: Military Power of the People's Republic of China" (2006)< http://www.dod.gov/pubs/china.html>.

[402] *See* Michael Mineiro, "FY-1C and USA-197 ASAT Intercepts: An Assessment of Legal Obligations under Article 9 of the Outer Space Treaty" 34(2) Journal of Space Law 321 (2008).

[403] *See also* Peter Van Fenema, *The International Trade in Launch Services*, (Leiden Faculty of Law: 1999) at 183 -240.

[404] *See* Peter H. Koehn & Xiao-Huang Yin, *The Expanding Roles of Chinese Americans in Foreign Relations* (East Gate Publishing, New York: 2002).

asymmetric incentives contribute, at least to some extent, to the continuation of the China launch services boycott.

The evidence is less compelling with regards to the Strom Thurmond Defense Act (STDA) mandate for all Comsats to be listed on the USML ITAR. This is because neither the political risk of a "public scandal," nor the political self-interests identified *supra* are strongly associated with reform. Repealing the STDA mandate could be achieved as easily as simply returning Presidential discretion to the process of determining whether or not Comsat technologies should be included on the USML or the CCL. As a matter of fact, several legislative proposals, offered as early as the year two-thousand (2000), have proposed this simple legislative reform.[405]

These are not radical proposals. They only seek to grant the Executive the same discretionary authority for list determination that exists for all other items. The passage of this reform does not expose Congress to significant political risk because granting Executive authority for list determination does not necessarily mean Comsats will be taken off the USML. Instead, is passes the decision, and the political risk, onto the Executive.

Since the enactment of the STDA in 1998, Congress and the Executive have been controlled concurrently by both parties, but still no reform has been instituted. It therefore seems plausible to conclude that, at least with regards to the STDA, because there is little political risk for instituting STDA reform, the recalibrated cost theory better describes the reality of Comsat export control public choice as compared to the asymmetric official interest theory.

III. Inefficient Government Theory

While the Recalibration Theory provides some insight with regards to the initial decisions to boycott Chinese launch services and to list Comsats on the USML, it fails to

[405] *See Satellite Exports with Security Act of 2000* (Introduced by Rep. Sam Gejdenson (D-CT) 5/10/2000). *See also* U.S. House Resolution 2410, Section 826 (2009) (Introduced by Rep. Howard Berman (D-CA) on 5/14/2009; Referred to Senate Committee on 6/22/2009).

fully explain why reform has not been achieved since that time. In this sense, the hypothesis that alternative values are derived from these regulatory decisions has validity, but it fails to fully acknowledge that the United States is experiencing a diminished return on investment which should trigger a public policy response.

This diminishing return exists because while the U.S. has achieved some value from denial, delay, cost-adjusting, and signaling, the value of these objectives is being reduced by changes in the real world. As discussed *supra,* Europe has now developed ITAR free Comsat technologies, directly competing with the United States and undercutting U.S. Comsat export controls. Also, China has developed indigenous Comsat technologies to supplant the U.S. embargo. As a result, the benefit received from these Comsat regulatory decisions are diminishing even as the costs associated with ITAR and the China boycott continue. Since this is the factual case, the Recalibration Theory fails to fully explain why reform of these regulatory standards has not yet been achieved.

The Asymmetric Incentive Theory explains, in part, why reform has not yet been achieved. With regards to repealing the China launch boycott, several domestic political constituents have been identified that provide a countering self-interest for individual public officials. But the Asymmetric Incentive Theory fails to explain why legislative reform of the mandatory USML listing has not been achieved. There are no strong domestic constituent interests opposed to returning authority to the Executive to determine whether Comsat should be listed on the USML or CCL. There is also very little risk that an individual Congressman would face the risk of a public scandal, as the ultimate decisions to remove a Comsat from the USML would be within the Executive.

It is therefore a logical conclusion that another explanation is required to explain the failure of Comsat export control reform. It is the opinion of this author that a theory of inefficient government is an appropriate explanation to resolve this conundrum. The failures of reform efforts are not only because the hidden values associated with these controls do not justify continuation; nor is it only because the asymmetric self interests of individual Congressman justify continuation. The most logical explanation is that reform is justified, but has not been achieved because of inefficiencies in the operation of the

U.S. legislative system. Quite literally, Congress, as a collective, hasn't found the time and energy to pass needed reform legislation.

One can hypothesize many reasons why Congress has been inefficient with regards to U.S. Comsat export controls. First and foremost, it may be an issue of relative importance. While the U.S. Comsat industry is a multi-billion dollar industry, the U.S. economy is a multi-trillion dollar economy and part-for-parcel Comsats just aren't that important. Also, other legislative initiatives may take priority for the very reasons theorized above, Cost-Value and Asymmetric Incentives. For example, for reasons associated with both Cost-Value and Asymmetric Incentives, healthcare reform and the economic recession are the major legislative concerns for the 2009-2010 Congress, while U.S. Comsat export controls are not on the front burner.

Absent a concerted effort by the Executive, current U.S. Comsat controls will continue. Only when costs of inaction become too large for Congress to ignore, will Congressional reform be instituted. In this sense, one can theorize that for smaller regulatory issues Congress generally only responds once a situation has reached a level of importance that justifies the expenditure of Congressional time, energy, and political capital to resolve. In parlance, it can be said that Congress is reactive, not proactive, in particular when dealing with more nuisanced and/or relatively less important regulatory decisions. Normally this inefficiency is *not* an issue for export control regulations, as the Executive has been granted a fair amount of discretion on list item and license determination. The problem with U.S. Comsat export controls is that Congress has removed this authority from the Executive. As a result, the comparatively more efficient Executive bureaucratic decision making procedure is not available. Instead, Congress must act if Comsats are going to be removed from the USML or the boycott is to be lifted on Chinese launch services.

C. Chapter Summary & Conclusions

This Chapter reveals that the bifurcated cost-benefit economic and strategic effectiveness analysis of Chapter 5 failed to appropriately consider the multi-dimensional aspects of the STDA and China Launch Boycott policy and legislative decision making process. The failure of reform efforts to date indicates there are cost and benefit pressures that need to be considered in addition to the economic-strategic effectiveness findings in Chapter 5. There are three other public benefits that should be factored in: Delay, Cost-Raising, and Signaling. However, even with the inclusion of these additional benefits, the continuation of the STDA and China Launch Boycott is suspect due to a deterioration of realized benefits (e.g. a diminishing return) in light of increasing negative economic pact.

A strong case can be made that the failure to revoke the STDA mandate is a government failure, rooted in a combination of asymmetric political incentive and government inefficiency. Indeed, the aforementioned analysis revealed that, in large part, it is structural inefficiencies within the Congressional legislative structure of the United States, magnified by the removal of export control regulatory discretion from the Executive, which is the most likely explanation for why the STDA mandate has yet to be revoked.

The continuation of the China Launch Boycott raises a different set of policy concerns because of sensitivity in the United States regarding China as a strategic outer space competitor. This sensitivity requires a recalibration of cost-benefit in favor of caution on part of the U.S. Congress due to the risk of a public scandal in which Congressman in favor of boycott removal are critiqued as "weak on national security" and/or "pro-China." A re-conceptualization of the U.S.-China outer space strategic relationship is necessary before sufficient political support for revocation of the launch boycott will manifest.

Chapter VII

Legal Reform "Inside-the-Box" of the Current National Centric Paradigm: A Lacuna of Long-Term Strategic Vision

Current efforts in the United States to reform the Comsat export control system indicate the asymmetric costs and internal inefficiencies of the U.S. Congress are under increasing pressure for reform. No longer is the question of reform simply an exercise of discourse. Instead, legislation and executive policy is being written and implemented that will change the future of U.S. Comsat export controls.

In this Chapter pending and/or recent reform proposals are examined and specific law and policy reforms are recommended. The common trend amongst the reforms in this Chapter is that they all work "inside-the-box" of the current presumptive paradigm of space technology export controls as primarily a national endeavour. For the purposes of this Chapter, this paradigm is accepted as pragmatic. However, in Chapter 9 the national control paradigm is challenged and an alternative global approach to space technology trade and proliferation controls is proposed.

Some of the proposals examined in this and subsequent Chapters go beyond the scope of simply reforming Comsats. This is because the particular challenges to Comsats raise broader questions regarding the evolution of sovereign States and export control. Subsequent Chapters will continue this trend, ultimately relying on Comsats as a case-study example for macro-level findings on international space technology export controls and their nexus with international civil and commercial peaceful use and exploration.

In addition, this Chapter identifies an omission in U.S. export control policy. This omission is a failure to recognize space technology trade and proliferation controls is intimately linked to State engagement in global civil space cooperation. This omission is evidenced by the lacunae of U.S. policy to consider how the continuation of the current paradigm of trade and proliferation controls impacts mankind's future exploration and use of outer space.

A. National Export Controls: The Current Presumptive Paradigm of Space Technology Trade and Proliferation Controls

The key conceptual presumption that pervades the current paradigm of space technology controls is that trade and proliferation controls should originate at the national level, reflecting the prioritization of national security concerns. This conceptual paradigm is reflected in the absence of a legally binding supra-national space technology trade and proliferation control regime. This national conception of controls is complemented with an implicit strategic conception that State should maximize their legal discretion in exercising trade and proliferation controls. This strategic conception is reflected in the voluntary, non-legally binding agreements that pervade the so-called "international" system of space technology trade and proliferation controls.

Three important legal rules are derivative of this current national centric paradigm and they implicitly integrated into the U.S. export control regime. Rule #1 is that States are free to control the export of any items or technology so long as the State exercises legally legitimate jurisdiction over the items and/or technology.[406] Rule #2 is that States are free to adopt extraterritorial export controls.[407] Rule #3 is that in instances when the laws of a foreign State conflict with the extraterritorial application of an export control law, the foreign State has the discretion to deny extraterritorial application.[408]

Each State has almost complete discretion under international law on the production and trade of space technologies. The United States, as representative of a leading space technology power, protects its self-interest in this national centric system by imposing strict export controls. The necessity of strict export controls stems from the lack of internationally harmonized technology trade and proliferation controls. Absent a legally binding bilateral agreement with the importing State, an exporting State must rely

[406] *See* Chapter 1 of this thesis.

[407] A.L.C. De Mestral & T. Gruchalla-Wesierski, *Extraterritorial Application of Export Control Legislation: Canada and the U.S.A.* (Netherlands: Kluwer Academic Publishers, 1990) at 269.

[408] *See* A.L.C. De Mestral & T. Gruchalla-Wesierski, *Extraterritorial Application of Export Control Legislation: Canada and the U.S.A.* (Netherlands: Kluwer Academic Publishers, 1990) at 269.

first and foremost on their own national legal jurisdiction and authority to protect against unauthorized technology transfer and use prior to the export leaving its national boundaries. Those non-legally binding arrangements that States do establish are only partial remedies, providing at best a political agreement that mandates transparency. Notably absent from this national centric paradigm are internationally harmonized standards and transnational compliance, verification, and enforcement mechanisms.

As discussed in Chapter 2, States by their very nature are defined by two principal characteristics: their legal rights as a "sovereign" and their delimitation of sovereign authority which is based on geographic physical territory.[409] These two characteristics of States are closely inter-related to the current presumptive paradigm of national export controls. First, Sovereign States are legal-political units that form the implementation and enforcement structure of modern export control. As a result, the current thinking defers to States as the point of origin for law and regulations. Second, the international legal concept of sovereign territory as the basis of legal jurisdiction for the creation, implementation, and enforcement of export control law presupposes an international concept of export controls as originating from the delimited territorial zones of a State in which it exercises sovereign authority.

This current national centric paradigm of trade and proliferation controls is functionally sufficient. There are international civil, commercial, and military activities in space and they are supported by international trade in commercial space technologies and services. However, it is hypothesized that the current approach is inhibiting global civil space cooperation. In Chapter 8 of this thesis, this hypothesis is tested and it is proposed that neither effective export controls nor effective sovereignty is *necessarily predicated* on the exercise of trade and proliferation controls solely on the basis of independent national territorial boundaries. Instead, an alternative global approach to space technology trade and proliferation controls is possible.

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[409] *See* Chapter 2 of this thesis: *Sovereignty as a Precondition to Control*.

B. Overview of Types of Reforms

Before examining particular reform proposals and their underlying rational, it is useful to first take inventory of them and place them within particular categories. In this section, reforms are categorized based on their respective level of legal authority and policy scope. Within the field of Comsat export controls, reform can be conceptualized as being one of three types: Process, Policy, and/or Strategic Level reform.

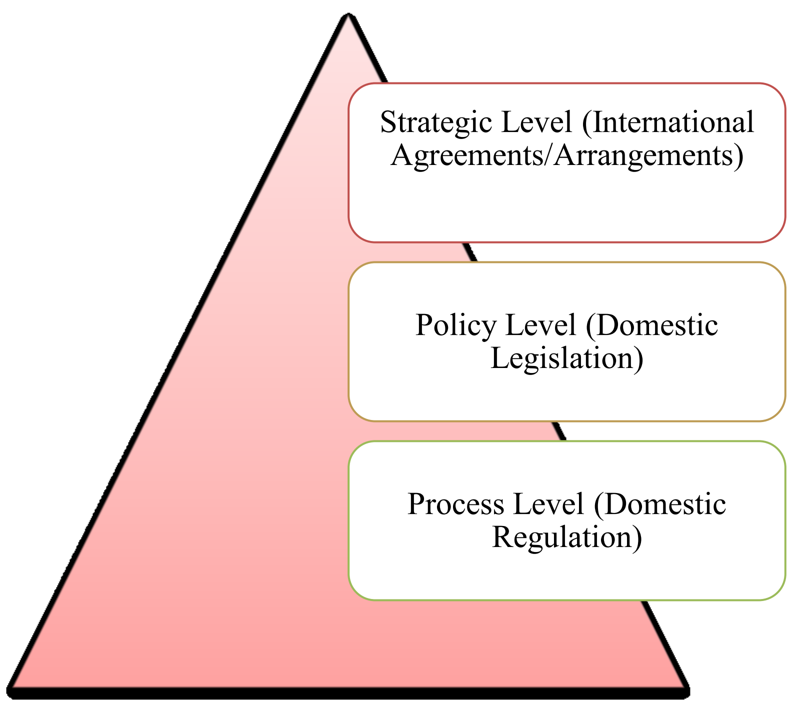
(I) Process level reform proposals: These reforms occur at the regulatory implementation level. They range from the minutia of licensing application processes to broader proposals of executive administrative structure. In the United States, these reforms occur at either the Executive administrative level or within a particular executive agency. Reform is limited to the extent of discretionary authority granted to the Executive by Congress within enabling export control legislation. In unique circumstances, Constitutional grants of Executive authority could be interpreted to allow the Executive to implement process level reforms beyond Congressional authorization.

(II) Policy level reform proposals: These reforms focus on Congressional legislation and national export control policy. Policy level reform proposals provide the law and policy infrastructure for the export control regulatory process. Reforms at the policy level result in fundamental changes to the domestic export control system structure. Typically, these reforms are instituted at the Congressional level. In some instances, Executive policy can supplement and/or complement Congressional legislation and contribute to policy level reform.

(III) Strategic level reform proposals: These reforms look to international agreements, arrangements, interstate relations, and/or U.S. foreign policy as the tools to implement long-term and wide-ranging international and domestic export control reform. The Executive will lead strategic level reforms within the field of foreign policy and inter-state relations and its role is manifested in the negotiation and conclusion of international agreements and/or arrangements. Congress contributes to strategic level reform by implementing legislation and/or via the Senatorial treaty approval process.

Hierarchy of Reform Types

These three levels of reform create a hierarchy. The highest level of the hierarchy is strategic level reform. The law and policy implemented at this level provide the long-term vision of U.S. domestic and foreign policy. Law and policy at the strategic level can be thought of as the destination for which all lower level other State law and policy contribute towards. Historical examples of strategic level law and policy include the establishment and promotion of the United Nations (and its associated international legal framework), NATO, détente with China during the Nixon administration, and the WTO. Strategic level law and policy always carries with it a particular world-view or vision of the future that is sought to be promoted and/or achieved.



C. Literature Review Analysis of Reform Proposals

A literature review of publicly available documents was conducted to identify specific reform proposals for U.S. Comsat and export controls more broadly. This literature review included hundreds of published scholarly articles, pending legislation, government reports, think tank position papers, press releases, Congressional testimony, NGO policy position papers, newspaper articles, etc..[410]

The findings of this review are as follows:

1- Since 1999, reform of the Comsat export control system, and also more broadly the U.S. export control system governing space technologies, has been a subject of considerable discourse.
2- The discourse is dominated by Process and Policy proposals in the immediate and short-term time range.
3- The lack of long-term and/or Strategic proposals signals a focus within the discourse for legislative and/or executive level reforms and a failure to fully consider international and foreign policy reform measures.

Matrix of U.S. Reform Proposals in the Public Discourse

Type and Time-Range of Proposals	Immediate	Short-Term (5 yrs or less)	Long-term (5 yrs or more)
Process	X	X	/
Policy	X	X	/
Strategic	/	/	O

[X = Prevalent; / = Minimal Presence; O = Notably Absent]

Examples of COMSAT and Space Technology Export Control Reform Proposals in the Public Discourse

[410] *See Bibliography* of this thesis for the list of documents reviewed.

Below are examples of reform proposals in the public discourse.

(I) Process Level Proposals:

-Create a new "space technology control office"[411]

-Decrease the processing time for license applications[412]

-Improve the licensing process procedure and criteria[413]

-Improve guidance and licensing officer training[414]

-Establish risk-based programs to monitor deemed export license conditions[415]

-Allow applicant participation in review of denied license application[416]

-Create a Coordinating Center for Export Controls[417]

-Improve the USML/CCL list determination procedure[418]

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[411] *See* John Heinz, *U.S. Strategic Trade: An Export Control System for the 1990s,* (Oxford: Westword Press, 1991). *See also* "Garn/Heinz Introduce Bill to Centralize Export Control" *Defense Daily* Oct. 27th 1989.

[412] *See* Ann Calvaresi-Barr, *Export Controls: Vulnerabilities and Inefficiencies Undermine the System's Ability to Protect U.S. Interests* (U.S. GAO, GAO-07-1135-T, Washington, D.C.; July 26th, 2007).

[413] *See* Ann Calvaresi-Barr, *Export Controls: Vulnerabilities and Inefficiencies Undermine the System's Ability to Protect U.S. Interests* (U.S. GAO, GAO-07-1135-T, Washington, D.C.; July 26th, 2007).

[414] *See* Ann Calvaresi-Barr, *Export Controls: Vulnerabilities and Inefficiencies Undermine the System's Ability to Protect U.S. Interests* (U.S. GAO, GAO-07-1135-T, Washington, D.C.; July 26th, 2007).

[415] *See* Ann Calvaresi-Barr, *Export Controls: Vulnerabilities and Inefficiencies Undermine the System's Ability to Protect U.S. Interests* (U.S. GAO, GAO-07-1135-T, Washington, D.C.; July 26th, 2007).

[416] *See* Harold Berman & John Garson, "U.S. Exports Controls – Past, Present, and Future" 67(5) Colum. L. Rev. 791 (1967) at 882.

[417] *See* Patricia Wrightson *et. al., Beyond "Fortress America": National Security Controls on Science and Technology in a Globalized World* (Washington D.C.: National Academies Press, 2009). *See also*, Ali Ahmadi, *U.S. Export Control Law Applicable to Commercial Telecommunication Satellite Technology Destined for China* (LL.M. Research Project, McGill University Institute of Air & Space Law, 2010). In this proposal, all exporters apply for licenses through the CCEC. The CCEC determines which department has jurisdiction over a particular license application. It is proposed that this would allow for more independent and consistent interpretation of statutory criteria, since neither the Department of Commerce nor Department of State has authority to determine jurisdiction.

-Update Congressional Notification Thresholds and Processes[419]

(II) Policy Level Proposals:

-Revoke the China Launch Boycott[420] established in the Tiananmen Square Sanctions of 1990-1991

-Revoke the STDA USML Mandate[421] and return USML/CCL List determination discretionary authority to the Executive

-Create a new independent Office of Strategic Trade and Technology (OSTT)[422]

-Punish foreign companies that violate the China Launch Boycott by prohibiting federal contracts[423]

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[418] *See* Anne-Marie Mazza *et. al., Science and Security in a Post 9/11 World: A Report Based on Regional Discussions Between the Science and Security Communities* (Washington, D.C.: National Academies Press). *See also*, Pierre Chao, *Toward a U.S. Export Control Technology Transfer System for the 21st Century* (Washington, D.C.: National Academies Press, 2007). Improvement proposals include: more thorough studies of satellite technology to adopt specific technical criteria related to military criticality, continuous review of list items, and the establishment of a neutral assessment body to provide technical opinion on list technologies.

[419] *See* Ms. Marion Blakey, *Statement for the Record – Before the House Foreign Affairs Committee (HFAC) – subcommittee on Terrorism, Non-Proliferation, and Trade,* (Hearing on Strategic and Economic Review of Aerospace Exports, Serial No.111-74, 9 December 2009) at 41.

[420] *See* Ali Ahmadi, *U.S. Export Control Law Applicable to Commercial Telecommunication Satellite Technology Destined for China* (LL.M. Research Project, McGill University Institute of Air & Space Law, 2010) at 68-70.

[421] *See* U.S., Bill H.R. 2410, *Foreign Relations Authorization Act FY 2011-2012*, 111th Congress (2009), §826.

[422] *See* John Heinz, *U.S. Strategic Trade: An Export Control System for the 1990s,* (Oxford: Westword Press, 1991) at 150. *See also* "Garn/Heinz Introduce Bill to Centralize Export Control" *Defense Daily* Oct. 27th 1989. This office would be created within the Executive Office of the President as the single agency responsible for technology security issues. Its director would be the President's principal adviser on technology issues and would serve in the Cabinet. Day-to-day licensing of dual use and munitions items, control list review, and other routine operations of the U.S. export control system would be the exclusive province of the OSTT.

[423] *See* U.S., Bill H.R. 3840, *Strengthening America's Satellite Industry Act*, 111th Congress (2009).

(III) Strategic Level Proposals:

-Redouble United States diplomatic efforts to strengthen national and international arms export controls by establishing a senior-level initiative to ensure that those arms export controls are comparable to and supportive of United States arms export controls, particularly with respect to countries of concern to the United States[424]

-Allay concerns of unauthorized technology transfers during Chinese launch of U.S. origin technologies by entering into U.S.-China bilateral technology safeguard agreements[425]

D. Conformity Approach v. The Escalation Approach

The aforementioned categories of Process, Policy, and Strategic reforms explain particular law-policy reform techniques, drawing parameters on the range and type of law and policy tools utilized at different levels of reforms. But simply identifying the parameters limits a more robust understanding of the actual reform underway in the United States. What is needed is a supplementary context to provide articulation of the underlying law and policy rationales that drive specific Process, Policy, or Strategic level reforms.

There are two basic law and policy approaches that are underway in the United States: the Conformity Approach and the Escalation Approach. Both approaches accept the empirical finding that the current U.S. Comsat export control system cannot be sustained because substantial economic costs will be imposed on the United States without a concomitant strategic return on investment. Both approaches also acknowledge that greater international Comsat export control regulatory conformity is needed. The difference between these approaches is the type of convergence sought to be achieved and the associated underlying perspectives on international politics and national interest.

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[424] U.S., Bill H.R. 3840, *Strengthening America's Satellite Industry Act*, 111th Congress (2009).

[425] *See* Ali Ahmadi, *U.S. Export Control Law Applicable to Commercial Telecommunication Satellite Technology Destined for China* (LL.M. Research Project, McGill University Institute of Air & Space Law, 2010) at 68-70.

Proponents of the Conformity Approach adopt the position that the STDA USML Mandate and the China Launch Boycott should be reformed and/or revoked. The Conformity Approach believes that the STDA USML mandate and China Launch Boycott are not necessary to achieve effective Comsat export control. As a result, the Conformity Approach seeks reform that will revoke these laws and move towards Comsat dual-use standards and liberalized launch trade and controls. In other words, proponents of the Conformity Approach agree with the underlying strategic rationale of the European Comsat dual-use approach and want the U.S. to move in that direction.

Proponents of the Escalation Approach believe that the United States should leverage addition legal measures to coerce foreign States towards regulatory convergence with the United States and that the STDA USML mandate and China Launch Boycott serve the national interests of the United States. The regulation of Comsats as dual-use and the allowance of Chinese launch services by foreign jurisdictions is viewed as a strategic threat to the United States. Implicit in this approach is the world-view of China as a space strategic competitor.

As will be exampled *infra,* between these two approaches, the Conformity Approach has gained more support in recent times. As will be also discussed in greater detail *infra* (and in subsequent Chapters), both of these approaches are buttressed with competing strategic visions of the international space fairing community and the future of strategic space activity.

E. Pending Legislative and Executive Reforms: The Conformity Approach

Since President Obama took office in January 2009, several legislative and executive Conformity Approach reforms have been proposed and/or implemented.

On June 10th, 2009, the U.S. House passed new legislation that, if adopted by the Senate and enacted into law, will have a significant impact on how the United States categorizes SQUIPE for export control purposes. This legislation is H.R. 2410, *Foreign*

Relations Authorization Act FY 2011-2012, §826 (2009).[426] It returns discretion to the President to determine whether or not and what types of SQUIPE (including Comsats) should be categorized and controlled as munitions or dual-use goods.[427] In doing so, it practically results in the revocation of the STDA USML Comsat mandate. The only exception to this revocation is with regards to China.[428] The China Launch Boycott, as first established in the Tiananmen Square Sanction of 1990-1991, remains law, subject to the elevated standard of Executive waivers to be granted only in the "interest of national security."[429]

H.R. 2410 is not Congress' only pending legislative proposal. On October 15th, 2009, H.R. 3840, *Strengthening America's Satellite Industry Act,* was introduced in the House of Representatives and referred to the Committee on Foreign Affairs.[430] H.R. 3840 is a bill similar to H.R. 2410 §826 in that it provides a legal mechanism to override §1512 of the 1999 Strom Thurmond Defense Act (the law that removed Presidential authority to determine what satellite items and technologies are subject to DOS/ITAR or DOC/EAC control).[431] It also removes the financial burden on exporters under the AECA and

[426] U.S., Bill H.R. 2410, *Foreign Relations Authorization Act FY 2011-2012*, 111th Congress (2009), at §826.

[427] U.S., Bill H.R. 2410, *Foreign Relations Authorization Act FY 2011-2012*, 111th Congress (2009) at §826. §826(a) states: "Authority- Except as provided in subsection (b) and subject to subsection (d), the President is authorized to remove satellites and related components from the United States Munitions List, consistent with the procedures in section 38(f) of the Arms Export Control Act (22 U.S.C. 2778(f))."

[428] U.S., Bill H.R. 2410, *Foreign Relations Authorization Act FY 2011-2012*, 111th Congress (2009), at §826. §826(b) carves out the following exception for China: "The authority of subsection (a) may not be exercised with respect to any satellite or related component that may, directly or indirectly, be transferred to, or launched into outer space by, the People's Republic of China."

[429] *See* §902 of the Foreign Relations Authorization Act, Fiscal Years 1990 and 1991 (P.L. 101-246; 22 U.S.C. 2151 note). *See Strom Thurmond Defense Act,* 22 U.S.C. §2778, P.L. 105-261 (1998) at §1511-1516.

[430] U.S., Bill H.R. 3840, *Strengthening America's Satellite Industry Act*, 111th Congress (2009).

[431] U.S., Bill H.R. 3840, *Strengthening America's Satellite Industry Act*, 111th Congress (2009).§5(a) states: "Authority- Except as provided in subsection (b) and subject to subsection (d), the President is authorized to remove satellites and related components from the United States Munitions List, consistent with the procedures in section 38(f) of the Arms Export Control Act (22 U.S.C. 2778(f))."

provides for the DDTC to be self-financed. Like H.R. 2410, H.R. 3840 excludes its grant of Presidential authority with respect to U.S. origin SQUIPE from launch in China.[432]

The Executive is also contributing to reform efforts. On September 29th, 2009, President Obama issued a delegation of authority to the Secretary of Commerce to report to Congress as required under §1512 of the 1999 Strom Thurmond Defense Act.[433] While this Presidential delegation has received a fair amount of press coverage, it does not practically impact the current U.S. SQUIPE export control regime. The legislation and implementation regulations governing SQUIPE remain the same. All that has been changed is a legislatively mandated reporting requirement has been delegated. Nonetheless, it was an important political signal from the Obama Administration, showing that export control reform is a priority.

U.S. President Barack Obama has also ordered a "sweeping interagency review" of U.S. rules that govern exports of unclassified military and dual-use technologies — including commercial communications satellites.[434] This review is part of the larger U.S. National Economic Strategy.[435] The results of this review shall be used to prepare a comprehensive set of recommendations to create a new U.S. export control system and

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[432] U.S., Bill H.R. 3840, *Strengthening America's Satellite Industry Act*, 111th Congress (2009).§5(b) states: "Exception- The authority of subsection (a) may not be exercised with respect to any satellite or related component that may, directly or indirectly, be transferred to, or launched into outer space by, the People's Republic of China."

[433] On Sept. 29th, 2009, President Obama issued Presidential Determination No. 2009-31: "Subject: Presidential Determination on the Delegation of Certifications under Section 1512 of Public Law 105-261. By virtue of the authority vested in me as President by the Constitution and the laws of the United States of America, including section 301 of Title 3, United States Code, I hereby delegate to you the functions of the President under section 1512 of the National Defense Authorization Act for Fiscal Year 1999."

[434] Amy Klamper, "Obama Memo Puts Export Reform on Front Burner", *Space News Online* (January 15 2010), available online at: <http://www.spacenews.com/policy/100115-obama-memo-puts-export-reform-front-burner.html>.

[435] *See* White House National Economic Strategy 2009 at pg.15, available online at < http://www.whitehouse.gov/assets/documents/SEPT_20__Innovation_Whitepaper_FINAL.pdf>. "The President has directed that the National Economic Council and the National Security Council review the overall U.S. export control system, tasking them to consider reforms that enhance America's national security, foreign policy, and economic security interests. While the U.S. has one of the most robust export control systems in the world, it remains rooted in the Cold War era of over 50 years ago. It must be updated to address the threats we face today and the changing economic and technological landscape."

the recommendations shall include statutory and regulatory steps necessary for implementation.[436]

In April, 2010, Secretary of Defense Robert Gates discussed the findings of the Administration's interagency review.[437] Based on this review, the Administration has determined that fundamental reform of U.S. export controls is needed in four component areas, with transformation to a:

-Single Control List,

-Single Primary Enforcement Coordination Agency,

-Single Information Technology (IT) System, and

-Single Licensing Agency.[438]

The administration plans to implement these reforms under a three-phrase approach. Phase I and Phase II will work within the current Executive authority granted by Congressional legislation. During these first two phases, Control Lists, Licensing, Enforcement and IT will be improved via Executive regulations and order. New control list criteria will be implemented to screen items. Licensing will be "streamlined" via policy and procedure standardization. Enforcement will be enhanced with an "enforcement fusion center." IT will transition to a single electronic licensing system. None of these phases would directly impact Comsats or their associated controls.

Phase III recognizes the need for Congressional legislation to achieve the four proposed component area transformations. In this Phase, Congress will enact legislation effectively replacing the historic two-tiered AECA/EAA export control system with a

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[436] Amy Klamper, "Obama Memo Puts Export Reform on Front Burner", *Space News Online* (January 15 2010), available online at: <http://www.spacenews.com/policy/100115-obama-memo-puts-export-reform-front-burner.html>.

[437] Press Release, "Fact Sheet on the President's Export Control Reform Initiative" (Office of the Press Secretary, White House: 20 April 2010).

[438] Press Release, "Fact Sheet on the President's Export Control Reform Initiative" (Office of the Press Secretary, White House: 20 April 2010).

single-tiered. While Comsats are not explicitly addressed in Secretary Gates briefing, implicitly the legislative restricting required to achieve Phase III reforms will include the revocation of the STDA mandate and the return of Executive discretion on control listing.

An analysis of these pending legislative and executive reform proposals reveals that they all fall within the category of either process or policy level reform and that they all adopt the Conformity Approach. Both legislative acts are short-term policy level legislative reforms that seek to modify the current Comsat export control system by restructuring discretionary authority. The Executive proposal to delegate authority to the Commerce department is a process level reform. The scope of President Obama's interagency review is limited to "statutory and regulatory steps" – e.g. process and policy level reform proposals. All three approaches seek to achieve international export control regulatory convergence through domestic reform efforts that result in the categorization of Comsats as dual-use and/or a less stigmatized approach to regulating commercial end-use space products.

Whether or not these reforms efforts will succeed is unknown. But their immediate success is not as important as the signal these efforts are sending. It is a signal that the costs associated with the STDA USML mandate are increasing to such an extent as to overcome the inefficiencies of Congressional action that were identified in Chapter 6. It also signals that as compared to the Escalation Approach, the Conformity Approach is gaining political support.

However, Comsat specific export control reform proposals within the government are currently limited to addressing the STDA USML mandate. In large part, this is because (as discussed in Chapter 6) China is still perceived as a strategic military threat with regards to space technology and lifting the boycott carries risk of "political scandal."[439] No significant political support has manifested for overturning the Boycott; e.g. the status-quo is the current political position.

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[439] *See* Chapter 6 of this thesis. *See also* Ronald Cass & John Haring, "Domestic Regulation and International Trade: Where's the Race? – Lesson from Telecommunications and Export Controls" in Daniel

F. The Duncan-Hunter Amendment: The Escalation Approach

Prior to Presidential election of 2008, the prediction that European manufacturers and service providers will avail themselves of China launch services once ITAR-free Comsat of comparable technical standards become available on the open-market was gained acceptance amongst Congressional Members. As has been demonstrated in this thesis, it is evident that investments in foreign indigenous ITAR-free technologies will soon release major Comsat manufacturers from the jurisdictional export control linkages of ITAR. In response, a group of Congressman led by Rep. Duncan Hunter (R-CA) successful passed a measure that adopted the Escalation Approach as a means to pressure foreign companies into adhering to the China Launch Boycott. On May 22nd, 2008, President George W. Bush signed into law the *Duncan Hunter National Defense Authorization Act of 2009*.[440] Buried within this omnibus funding bill is an amendment of particular importance to Comsat export controls. This amendment is codified in §1233 as *Review of Security Risks of Participation by Defense Contractors in Certain Space Activities of the People's Republic of China.*[441]

§1233 is an attempt by the United States to coerce foreign companies to adhere to the China Satellite Launch Boycott of the U.S. Tiananmen Sanctions of 1990-1991. It does so by establishing a supplemental coercive legal mechanism to influence foreign satellite manufacturers in lieu of U.S. export control licensing jurisdiction. The coercive leverage Congress is imposing over foreign manufactures is money; in particular the ability to bid on Requests for Proposals (RFPs) with the Department of Defense.

A literal reading does not reveal a coercive legal mechanism against foreign manufacturers because §1233 only mandates that "the Secretary of Defense conduct a

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Kennedy & James Southwick, Eds., *The Political Economy of International Trade Law,* (Cambridge University Press, 2002) at 145.

[440] *See The American Presidency Project of the University of California at Santa Barbara,* online at <http://www.presidency.ucsb.edu/ws/index.php?pid=77372>. *See Duncan Hunter National Defense Authorization Act of 2009,* Pub.L. No. 110-417, §1233, 122 Stat. 4639 (14 October 2008).

[441] *Duncan Hunter National Defense Authorization Act of 2009,* Pub.L. No. 110-417, §1233, 122 Stat. 4639 (14 October 2008).

review to determine whether there are any security risks associated with participation by covered contractors in certain space activities to the People's Republic of China."[442] But a closer reading of §1233, combined with an understanding of the politics behind the bill, shows that §1233 is reflective of a larger plan for U.S. Comsat export control policy to adopt reforms in line with the Escalation Approach.

The "certain space activities" specifically targeted in §1233 are "the development or manufacture of satellites for launch from the People's Republic of China" and "the launch of satellites from the People's Republic of China."[443] The "covered contractors" are "any contractor of the Department of Defense and any subcontractor (at any tier) of the contractor that has access to covered information and participates, or is port of joint venture that participates, or whose parent, sister, subsidiary, or affiliate company participates in certain space activities in the People's Republic of China."[444] "Covered information" means "classified information and sensitive controlled unclassified information obtained under contracts (or subcontracts of such contracts) of the Department of Defense."[445] Breaking down this legal language, what it means in practice is that any foreign satellite manufacturer or service provider, that in any way is associated with the development or manufacturing or launch of a satellite from China, is identified by the Department of Defense.

Once identified, the Secretary of Defense must conduct a review to determine whether there are any security risks associated with participation of the contractor with China. Matters to be included in the review are within the discretion of the Secretary of Defense, but at minimum the review must address the following:

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[442] *Duncan Hunter National Defense Authorization Act of 2009,* Pub.L. No. 110-417,, 122 Stat. 4639 (14 October 2008).

[443] §1233(e)(1) of the *Duncan Hunter National Defense Authorization Act of 2009,* Pub.L. No. 110-417, 122 Stat. 4639 (14 October 2008).

[444] §1233(e)(2) of the *Duncan Hunter National Defense Authorization Act of 2009,* Pub.L. No. 110-417, 122 Stat. 4639 (14 October 2008).

[445] §1233(e)(3) of the *Duncan Hunter National Defense Authorization Act of 2009,* Pub.L. No. 110-417, 122 Stat. 4639 (14 October 2008).

> (1) Whether there have been any incidents with respect to which a determination has been made that an improper disclosure of covered information by a covered contractor has occurred during the five-year period ending on the date of the enactment of this Act.
>
> (2) The increase, if any, in the number of covered contractors expected to occur during the 5-year period beginning on the date of the enactment of this Act.
>
> (3) The extent to which the policies and procedures of the Department of Defense are sufficient to protect against the improper disclosure of covered information by a covered contractor during the 5-year period beginning on the date of the enactment of this Act.
>
> (4) The Secretary's conclusions regarding awards of contracts by the Department of Defense to covered contractors after the date of the enactment of this Act.[446]

It is this last matter that is critical: "The Secretary's conclusions regarding award of contracts by the DOD to covered contractors." Essentially, Congress is asking the DOD to identify and investigate foreign companies that are launching satellites from China and to conduct a security assessment on them as a condition for continued or future award of DOD contracts. While this law does not prohibit "covered contractors" from continuing service for the DOD, it implies that if a security risk is identified, the "covered contractors" will be terminated and excluded from future contracts.

This law is specifically tailored to target companies like Eutelsat and Thales-Alenia. Thales-Alenia is manufacturing a Comsat that will be sold to Eutelsat and is scheduled to be launched on a Chinese vehicle in 2011/2012.[447] Congress, frustrated that

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[446] §1233(b) of the *Duncan Hunter National Defense Authorization Act of 2009,* Pub.L. No. 110-417, 122 Stat. 4639 (14 October 2008).

[447] *See* Stephen Clark, "Eutelsat Swaps Rockets for Satellite Launch this Summer" *SpaceflightNow.Com* (19 February 2010), available online at: <http://spaceflightnow.com/news/n1002/19eutelsatw3b/>. *See*

these European companies are circumventing the U.S. boycott, has sought to punish them by first identifying them as security risks and then, at some point in the future, restricting their ability to bid on space related RFPs (contracts/subcontracts) with the DOD.

Although it is difficult to predict the future actions of Congress, it is hypothesized that §1233 has been implemented with the idea that future legislation will be enacted to complement and strengthen its provision. In the near future, the issue of regulatory divergence will generate more political headlines as Europe begins selling and launching major satellites to China. If, at this point, Congress adopts an Escalation Approach type response, additional legislation will be proposed that punishes, most likely as an exclusion from receiving U.S. federal funds, any contractors identified by the DOD in a §1233 type review. Implementation of such a punitive measure will not necessarily succeed. Foreign suppliers have the discretion to decline participation in U.S. DOD contracts. However, if foreign suppliers are not responsive to such an approach, Congress may thereafter attempt to introduce even more coercive legislation, perhaps similar to the *Helms-Burton (Cuban Liberty and Democratic Solidarity Act) of 1996.*[448]

G. Inside the Box Reform Proposals

In this section, particular reforms are proposed that work within the current conceptual paradigm of Comsat export controls. These proposals adopt a mixture of Process, Policy, and Strategic level reforms, integrating both the Conformity and Escalation approaches. The Conformity Approach is correct that a movement towards a more liberalized Comsat export control regime would generate economic national benefits without a decline in the national security interests of the United States. But the

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Bruce Crumley, “China’s Takeoff in the Space Industry” *Time* (12 March 2009) online: time.com <http://www.time.com/time/world/article/0,8599,1881966,00.html>.

[448] *Helms–Burton Act*, Pub.L. 104-114, 110 Stat. 785, 22 U.S.C. § 6021–6091 (1996). This act established an economic embargo against the government of Cuba. The terms of the act apply explicitly to U.S. nations, permanent residents, and the U.S. government. In addition, the act establishes punitive measures against foreign nationals who violate the terms of the embargo. Congress, in theory, could pass a law creating a “satellite launch embargo” against China, seeking punitive measures against foreign nationals that violate the law.

Escalation Approach is also correct that simply conforming to the export control standards of foreign jurisdictions is a relinquishment of the American prerogative. In certain instances (as will be discussed *infra*), the Escalation Approach is appropriate.

It should be noted that these reforms are limited in two important ways. First, these reforms fail to address the Sovereign Geocentric paradigm of export controls associated with a self-justified security dilemma. Instead, this issue is examined in Chapter 8. Second, there is a lacuna in the current discourse as to meta-level "long-term strategic vision". This lacuna is addressed *infra* in Section 8 of this Chapter and in subsequent Chapters.

These limitations, while important to keep in mind, do not emasculate the utility of these recommendations. Congress must conceptualize reform along a continuum that includes the current conceptual paradigm. To their benefit, the recommendations in the Section are pragmatic and can be implemented without the political challenges of elevating public discourse to meta-level queries, while still alleviating some of the issues identified *supra* with Comsat export controls.

(I) Recommendation #1: Revoke the STDA USML Comsat mandate and return USML/CCL list determination for SQUIPE to the Executive. Both H.R. 2410 and H.R. 3840 are attractive legislative options to achieve this reform. Discretion is the preferred option because simply categorizing all items as munitions, regardless of their actual technical characteristics, results in non-strategic items failing within the ITAR licensing regime. This in turn hinders U.S. competitiveness in the international Comsat market.[449]

Once discretion is returned to the Executive, process level reforms should be instituted to create a more responsive and time-efficient list-determination process. Items should be reviewed on a continuing basis for determination of their strategic military

[449] *See* Chapter 5 of this thesis.

importance. Objective technical experts should be employed during the determination process.[450]

(II) Recommendation #2: Revoke the China Launch Boycott provisions of the Tiananmen Square Sanctions and allow Comsats to be launched on Chinese vehicles *if* appropriate bilateral technology safeguards are in place.[451]

Engaging China with technology safeguard agreements (TSA) is not without precedent. During the 1980s and 1990s, the United States established and launched Comsats under bilateral spacecraft technology safeguard agreements (TSAs) with China.[452] China has never been accused of violating the TSAs. Indeed, the Cox Commission Report only identified U.S. violations of ITAR in the post-accident investigation state of China launch services as export control violations – no findings were reached as to a violation of the China-U.S. Comsat TSA.[453]

Lifting the boycott provides a strategic benefit to the United States by granting U.S. manufacturers and service providers access to additional launch capacity. It will also increase competitiveness in the international launch market, theoretically lowering prices on launch services, and opening up additional markets for U.S. satellite and component manufacturers. It will also signal that the United States is moving towards an engagement policy with China in the field of space activities. In the long-term, peaceful engagement with China is preferred to confrontation and/or escalations of hostility. (In Chapter 9,

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[450] *See* Patricia Wrightson *et. al., Beyond "Fortress America": National Security Controls on Science and Technology in a Globalized World* (Washington D.C.: National Academies Press, 2009. *See also*, Ali Ahmadi, *U.S. Export Control Law Applicable to Commercial Telecommunication Satellite Technology Destined for China* (LL.M. Research Project, McGill University Institute of Air & Space Law, 2010).

[451] *See* Ali Ahmadi, *U.S. Export Control Law Applicable to Commercial Telecommunication Satellite Technology Destined for China* (LL.M. Research Project, McGill University Institute of Air & Space Law, 2010) at 68-70.

[452] *See* Peter Van Fenema, *The International Trade in Launch Services*, (Leiden Faculty of Law: 1999) at 183 -240.

[453] *See Declassified Report of the Select Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China* (Submitted by Rep. Cox, U.S.G.P.O, Washington D.C. ; January 3rd, 1999 – declassified May 25th, 1999). *See also* M. May ed., *The Cox Committee Report: An Assessment* (CISAC, Stanford: 1999) at 9, available online at < http://fsi.stanford.edu/publications/cox_committee_report_the_an_assessment/>.

competing strategic visions of the international space fairing community and the future of strategic space activity are discussed in greater detail).

(III) Recommendation #3: In addition to China, U.S. Comsats should be allowed for export to launch in India *so long as* appropriate bilateral technology safeguards are in place. India is predicted to enter the international commercial launch market in the near future and the Indian GSLV Mark 3 vehicle is expected to challenge China's position as a low-cost provider.[454] Because India is a rising space power and a major democratic State, it is in the interests of the United States to engage India in space activities, including commercial launch services. In the future, India may provide a geo-political balance to China, in both terrestrial and space matters, and this balance would be in the interests of the United States. As a democratic State with similar political ideals, India's rise as a space power should also complement broader U.S. foreign policy objectives.

The United States has already begun building a close relationship with India's space launch sector. In 2009, the U.S. and India signed a Civil Spacecraft Technology Safeguard Agreement that facilitates the launch of U.S. spacecraft components and safeguarded technology on Indian launch vehicles.[455] The success of this civil TSA can be leveraged into a Commercial Spacecraft Technology Safeguard Agreement.

(IV) Recommendation #4: The lifting of the China Launch Boycott and the entrance of India into the international launch market will place additional competitive pricing pressures on the U.S. domestic launch industry. Legislation should be enacted that supports the U.S. domestic launch industry, but that does not rely on trade boycotts. The rationale is that a self-sustainable U.S. domestic launch industry, that is competitive in the international market place, is to the benefit of the United States.

Measures to assist the U.S. domestic launch industry could include:

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[454] World Space Risk Forum, "Lower –Cost Options Enter Launch Market" 21(10) *Space News* (8 March 2010) at 15.

[455] *U.S-India Joint Statement on concluding a Civil Spacecraft Technology Safeguard Agreement* (Bureau of Public Affairs, Office of Spokesman: July 20th, 2009), available online at: U.S. Department of State website <http://www.state.gov/r/pa/prs/ps/2009/july/126230.htm>.

-Loans: The federal government can establish a federally-backed loan and insurance program. Loans provided to commercial launch service providers could be insured by the federal government.[456]

-Insurance: Liability insurance can be provided to launch vehicle service providers at a federally subsidized rate if the liability insurance market is not able to provide insurance at economically feasible rates (as defined by Congress).[457]

-Privatization of government space transportation: Recently the Obama Administration set into motion the privatization of NASA's space transportation. The Administration has cancelled the government's Constellation project and instead is shifting towards purchasing transportation from U.S. commercial launch service providers, including transportation for humans to outer space. This privatization shift is further supported by federal research and development funds to private commercial space transportation companies for "crew concepts, technology demonstrations and investigations for future commercial support of human spaceflight."[458] Continued support for the privatization of NASA space flight will generate economic incentives for U.S. domestic launch service providers to develop new technologies and compete in the marketplace.

-Tax Incentives: The Federal Government can create tax incentives for R +D development of commercial space launch technologies. Canada provides a good model with their SR&ED (Scientific Research and Experimental Development) tax credits.[459]

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[456] *See* Michael Mineiro, "Law and Regulation Governing U.S. Commercial Spaceports: Licensing, Liability, and Legal Challenges" 73(4) Journal of Air Law & Commerce 758 (2009) at 804.

[457] *See* Michael Mineiro, "Law and Regulation Governing U.S. Commercial Spaceports: Licensing, Liability, and Legal Challenges" 73(4) Journal of Air Law & Commerce 758 (2009) at 804.

[458] Frank Morring Jr., "NASA Stimulates Commercial Space" *Aviation Week* (1st February 2010), available online at: <http://www.aviationweek.com/aw/generic/story_channel.jsp?channel=space&id=news/awx/2010/02/01/awx_02_01_2010_p0-201241.xml>.

[459] *See* Canada Revenue Agency, "Scientific Research and Experimental Development (SR & D) Tax Incentive Program" online at http://www.cra-arc.gc.ca/sred/.

-National Security Launch Reserve: The Federal Government should maintain a domestic launch service capability to the extent necessary to ensure U.S. access to outer space in the event of an emergency. This reserve could be held in different ways; as a military, civil, or private industry reserve. In any case, the result should be to ensure U.S. access to space in the event of an emergency.

(V) Recommendation #5: Strengthen the Wassenaar Arrangement. This is a recommendation in line with the Escalation Approach. The current Wassenaar Arrangement fails to achieve sufficient inducement amongst Members as to achieve regulatory convergence. Licensing decisions for items on Wassenaar control lists do *not* require consent of fellow arrangement Members or provide any other mechanisms against undercutting.[460] Therefore the decision to transfer or deny transfer of any item is the sole responsibility of each Participating State.[461]

It would be better for the United States if Wassenaar Members were bound to a more stringent standard on list deviation. A history of U.S. participation in COCOM and Wassenaar shows that in disputes over list determination and export approval, the United States has traditionally supported more restrictive control – showing a greater reluctance on the part of the United States to export goods and technologies that fall in ambiguous dual-use and strategic/military contexts.[462]

Reform of Wassenaar would require a re-negotiation amongst Member States for more restrictive list determination and divergence standards. In the Wassenaar precursor, COCOM, consent was required for licensing decisions on list items; e.g. a veto power was granted amongst Members on licensing decisions. This approach was not included in the Wassenaar regime because it was deemed untenable and a proposal to reintroduce this

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[460] *See* Richard Cupitt & Suzette Grillot, "COCOM is Dead, Long Live COCOM: Persistence and Change in Multilateral Security Institutions" 27 B.J. Pol. S. 361 at 364 (1997). *See* Yoko Yashura, "The Myth of Free Trade: The Origins of COCOM 1945-1950" The Japanese Journal of American Studies, No.4 (1991).

[461] *Wassenaar Arrangement* at Scope, para.3.

[462] *See* Richard Cupitt & Suzette Grillot, "COCOM is Dead, Long Live COCOM: Persistence and Change in Multilateral Security Institutions" 27 B.J. Pol. S. 361 at 387 (1997).

approach would not be successful. However, there are other ways to strengthen Wassenaar without returning to the COCOM consensus standard.

One approach is to keep the discretion of a licensing decision as the sole responsibility of each Participating State, but to supplement it with an *ex ante* dispute resolution mechanism. This dispute resolution mechanism would allow other Member States to appeal to a body of proliferation and technology experts that would rule as to whether a proposed export would violate an export standard. This standard would have to be negotiated amongst the States, but one can hypothesize such a standard would be related to the collective peace and security of the Member States. Depending on the legal authority of the dispute resolution panel, a ruling that a particular export will violate the standard could have different effect, ranging from a non-binding ruling to a legally binding license denial.

A similar approach would be to implement an *ex ante* "denial consultation" mechanism, similar to the type that operates in the European Union.[463] In Europe, the Code of Conduct for Arms Exports contains a denial information exchange and consultation rule with undercut procedure.[464] Before any Member State grants a license that has been denied by another Member State (or States) it must consult with the State that issued the denial.[465] If these States cannot reach an agreement, the exporting State must give a detailed justification.[466]

In conjunction with the aforementioned recommendation to strengthen Wassenaar, participating States should be expanded to include developing space actors. Currently, Wassenaar membership does not include Brazil, China, or India, even though

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[463] Jamil Jaffer, "Strengthening the Wassenaar Export Control Regime" 3 Chi. J. Intl. 519 (2002) at 523.

[464] Yann Aubin & Arnaud Idiart, *Export Control Law and Regulation Handbook* (Kluwer Law International, 2007) at 112.

[465] Yann Aubin & Arnaud Idiart, *Export Control Law and Regulation Handbook* (Kluwer Law International, 2007) at 112. *See* Code of Conduct for Arms Exports, (8 June 1998) [2003] OJ C 320/01, available online at: <www.fas.org/asmp/campagins/code/eucodetent.htm>.

[466] Yann Aubin & Arnaud Idiart, *Export Control Law and Regulation Handbook* (Kluwer Law International, 2007) at 112. *See* Code of Conduct for Arms Exports, (8 June 1998) [2003] OJ C 320/01, available online at: <www.fas.org/asmp/campagins/code/eucodetent.htm>.

all of these States have active space programs. The rationale for inclusion is multifaceted. First, participation of active space powers would better facilitate the goal of regulatory convergence. Second, participation in Wassenaar should provide synergetic benefits in ancillary civil space activities. States who work within the arrangement will be able to develop the human and organizational relations that will support other space-related endeavours (such as civil space joint mission). Third, commercial space actors may benefit by the inclusion of rising space powers if participation in Wassenaar is linked to other trade and technology safeguard agreements.

(VI) Recommendation #6: Key Country Agreements.[467] In addition to strengthening the Wassenaar Agreement, the United States can enter into bilateral agreements with States that share the U.S. views on Comsat and SQUIPE export controls.[468] This approach is reasonable because only a small number of States manufacture high-tech SQUIPE and engaging in selected bilateral negotiations is comparatively less difficult than negotiating multilateral agreements. However, it is important the U.S. carefully examine with whom it shares common ground in the context of the space technology global security environment.[469]

A recent example of a key country agreement is the U.S.-U.K. Defence Trade Cooperation Treaty.[470] The purpose of this treaty is to provide a comprehensive framework for Exports and Transfers of items listed on the USML, without a license or other written authorization.[471] Exports and transfers under this treaty are only granted in

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[467] Jamil Jaffer, "Strengthening the Wassenaar Export Control Regime" 3 Chi. J. Intl. 519 (2002) at 524.

[468] *See* Bruce Vaughn, *CRS Report for Congress: U.S.-Australia Treaty on Defense Trade Cooperation* (Congressional Research Service: Washington, D.C., 12 December 2007). The United States recently signed Defense Trade Cooperation Treaties with Australia and the U.K.. The purpose of these treaties is to facilitate defense trade and cooperation.

[469] Jamil Jaffer, "Strengthening the Wassenaar Export Control Regime" 3 Chi. J. Intl. 519 (2002) at 525.

[470] *See Treaty Between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland Concerning Defense Trade Cooperation* (signed on 21 June 2007), available online at U.S. Department of State < http://www.state.gov/t/pm/rls/othr/misc/92770.htm>.

[471] Article 2, *Treaty Between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland Concerning Defense Trade Cooperation* (signed on 21 June 2007).

support of particular activities. These particular activities are "combined military or counter-terrorism operations," "cooperative security and defence research, development, production and support programs," "mutually agreed specific security and defence projects," and "United States government end-use."[472] As a model for future SQUIPE trade agreements, the U.S.-U.K. Defence Cooperation Treaty can be readily modified to support activities such as "combined space operations," "cooperative spacecraft and SQUIPE research, development, and production," and other space-related activities.

(VII) Recommendation #7: In the long-term, the United States must support the development of export controls that operate within the reality of techno globalization.[473] These reforms should implement controls that recognize the proliferation of technologies and associated technical knowledge is directly linked to the expansion and development of globalized human networks of information and technical innovation exchange that support the global Comsat marketplace.[474]

The current U.S. export control regime adopts a transaction-based approach, building legal barriers (e.g. "firewalls") around U.S. companies, nationals, and permanent residents against foreign technical knowledge exchange based on individual transactions. But this transactional approach conflicts with the nature of the globalizing Comsat marketplace; a market place of non-physical communication, non-physical transactions, multi-national manufacturing, purchase, and sale activities; a marketplace that demands regulatory transparency and efficiency.

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[472] Article 3(1), , *Treaty Between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland Concerning Defense Trade Cooperation* (signed on 21 June 2007).

[473] As discussed in Chapter 3, techno-globalization is: "The accelerating proliferation of technologies and associated technical knowledge beyond human networks of technical innovation that are traditionally associated with a particular State or national identity. Underlying this proliferation are increasingly integrated human communication networks that facilitate new forms of human innovation systems. "

[474] Non-physical exports have been identified as one challenge associated with new the integrated human communication networks of techno-globalization. *See* Gregory Bowman, "Email, Servers and Software: U.S. Export Controls for the Modern Era" 35(2) Georgetown Journal of International Law 319 (2004).

One example of an alternative to the transaction approach is the "account-based" approach.[475] An account-based approach provides clear export authorization for many export activities, without the need to either identify or review discrete export activities or the need to maintain export records above and beyond ordinary corporate records.[476] For most commercial exports, in particular exports to related entities, exports to established customers, or other types of deemed exports, an account-based approach would be effective.[477] Whether or not an approach based reform will work with Comsats will depend on the technical and political environment in which Comsat exports are operating. As commercial communication satellites continue to proliferate, it is predicted they will increasingly be perceived as innocuous enough to fall within an account-based approach system.

The advantage of an account-based approach is that it would "reduce export compliance difficulties currently faced by many exporters – especially those engaged in non-physical transactions- since it would de-emphasize the need to identify and review each specific export event, and instead place greater focus on identifying and resolving end-use and end-user concerns."[478] Furthermore, an account-based approach does not emasculate foreign policy and/or national security bases of control; State-specific trade restrictions can still apply.

H. U.S. Policy Adrift, the Lacuna of Long-Term Strategic Vision

Current reform efforts and proposals primarily address process and policy level action. While these types of proposals can be useful, they are limited. But what is not being directly addressed in this discourse is the underlying strategic vision of the United

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[475] *See* Gregory Bowman, "Email, Servers and Software: U.S. Export Controls for the Modern Era" 35(2) Georgetown Journal of International Law 319 (2004).

[476] Gregory Bowman, "Email, Servers and Software: U.S. Export Controls for the Modern Era" 35(2) Georgetown Journal of International Law 319 (2004) at 368.

[477] Gregory Bowman, "Email, Servers and Software: U.S. Export Controls for the Modern Era" 35(2) Georgetown Journal of International Law 319 (2004) at 368.

[478] Gregory Bowman, "Email, Servers and Software: U.S. Export Controls for the Modern Era" 35(2) Georgetown Journal of International Law 319 (2004) at 368.

States within a world of sovereign States, in particular a geo-political vision of space technology, space activities, and foreign policy.

As the term indicates, there are three elements to a "long-term strategic vision." The first is temporal: "long term." The United States needs to look beyond the immediate future, even beyond even our current lifetimes. Policy should be instituted that considers the evolution of the United States and the world community on a temporal metric that transcends immediate political concerns. At the same time, it should be recognized that interconnectedness of the global community is accelerating the temporal dimension of how policy impacts human behaviour and our environment.[479]

The term "strategic" incorporates the multifaceted synergetic connectivity of U.S. policy. Comsat export controls represent only one small part of the totality of U.S. law and policy, but this small area is connected to the greater collective. Reform of Comsat export controls should be elevated to address meta-level implications. "Strategic" also raises the necessity of a goal. Generating law and policy simply for the sake of it is useless; it is not strategic.

And this leads us to the third term, "vision." Vision is the human element to the equation. It is the ability to conceptualize of something that is not, and to strive for that goal. Within the context of this case study, it is the conceptualization of the international community of States and our collective human undertakings in outer space (with outer space technology) that needs to be addressed.

The failure of the U.S. to explicitly address a long-term vision has resulted in policy drift. This "drift" is subject to various pressures (e.g. inputs) that affect the evolution of U.S. export control policy. The U.S. Government is reactive, responding to outside factors, never properly seizing and focusing the potential energy of the United States or the world community of States to advance mankind's interests in outer space.

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[479] *C.F.* Ray Kurzweil, "The Law of Accelerating Returns" *KurzweilAI.net* (7 March 2001) available online <http://www.kurzweilai.net/articles/art0134.html?printable=1>. Mr. Kurzweil theorizes that technological change is exponential and that as a result, faster and more profound biological and social changes will occur.

U.S. policy drift can be distinguished as between (1) drifts occurring within the internal oscillations of policy that operate within the current paradigm of export controls and (2) policy drift resulting from the failure of the U.S. to proactively direct the evolution of export controls as is relevant to the sovereign State paradigm. As is discussed *infra* and in Chapter 8*,* the oscillation of policy operating within the current paradigm of export controls causes relatively small changes in the overall evolution of international trade and proliferation controls. But the failure of the U.S. to proactively advance trade and proliferation control in light of long-term objectives, in particular the principles of international space law, results in an evolution of international law and international cooperation that is subject to the inherent characteristics of the international system *and not* to the legal principles enunciated in the *Outer Space Treaty*.

(I) Drifts Occurring within the Internal Oscillations of Policy

Since the enactment of the *Neutrality Act of 1935*, U.S. export control policy has oscillated within the sovereign geocentric paradigm. This oscillation has created circular policy discourse around the question of balancing "national security interests" with "economic interests." This discourse (as discussed *supra*) maintains the conceptual paradigm of an "us v. them" mentality, measuring national security and economic activity against the metric of other States. This circular reasoning is self-justified by a false reliance on the current sovereign State paradigm of export control and associated munition production rights.[480]

Within this circular discourse, U.S. policy shifts are influenced by a range of factors, including immediate domestic economic and political concerns, U.S. foreign relations and the activities of other States. Examples of this oscillation include amendments to U.S. export control law in the late 1960s and 1970s in conjunction with détente between the U.S. and Eastern European State (1960s) and China (late 1970s), and

[480] *See* Chapter 8 of this thesis.

more recently the Tiananmen Square Sanctions and Strom Thurmond Defense Act of 1999.[481]

These oscillations create policy drift relevant to the evolution of domestic law within the United States, but they only minimally impact meta-level questions regarding inter-State relations and sovereign rights of control. This is because the policy drift operates within the geocentric sovereign State paradigm and does not normally challenge its structure.

The only noted exception to this general rule is with regards to the extraterritorial application of U.S. export controls. During the 1980s, the U.S. instituted a series of extraterritorial control measures that began to challenge earlier presumptions of sovereign State jurisdiction regarding exports.[482] At this time, affected States responded vigorously, establishing precedent through practice (as evidenced by domestic legislation and political position) against the extraterritorial application of U.S. export control laws and in favour of retaining traditional conceptions of sovereign State jurisdiction.[483] Today, the U.S. continues to apply "extra-territorial" export controls, but politically the issue has achieved détente and for the time being no significant movement on the issue is occurring.

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[481] *See* Chapter 4 of this thesis.

[482] *See* Selma Lussenburg, "The Collision of Canadian and U.S. Sovereignty in the Area of Export Controls" 20 Can.-U.S. L.J. 145 (1994). *See also* John Ellicott, "Competitive Impacts of U.S. Export Control Regulations" 14 Can.-U.S. L.J 63 (1988).

[483] *See* e.g. Selma Lussenburg, "The Collision of Canadian and U.S. Sovereignty in the Area of Export Controls" 20 Can.-U.S. L.J. 145 (1994). In 1990, Canada enacted the *Foreign Extraterritorial Measures Act (FEMA)* in response to U.S. extraterritorial export controls. FEMA provides the Canadian Government with authority to block the extra-territorial application of foreign anti-trust law and to block foreign trading directives and order which adversely affect Canadian interests. *See also* e.g. John Ellicott, "Competitive Impacts of U.S. Export Control Regulations" 14 Can.-U.S. L.J 63 (1988) at 69. In 1982 the United States attempted to stop construction of a natural gas pipeline (the *Western Siberian Pipeline)* from the Soviet Union into Western Europe by imposing export trade controls. Western European States reacted vigorously, with Britain, France, and the Netherlands invoking domestic legislation in response that resulted in unresolved conflicts of laws between the U.S. and importing States. Six months later, the United States rescinded the imposition of these controls to block the gas pipeline project. The pipeline was completed in 1984.

(II) Drift resulting from the failure of the U.S. to advance the evolution sovereign State export controls

By an act of omission, U.S. export control policy is impacting the evolution of human exploration and use of outer space – in particular international civil space cooperation. This omission is the failure of the U.S. to assess the current sovereign State paradigm as to the future of inter-State relations in outer space. As a result, the future of State relations, and the law governing States, is subject to self-reflexivity, in which the present international rule structure is perpetuated and continues to influence State policy. While the present paradigm will evolve, without State action to transcend the presumptions of this paradigm States become passive elements, empowering the historical incidents that have resulted in the current rule structure and tying down mankind's future activity in outer space to the thinking of past-generations. In Chapter 8, this omission is directly challenged and an alternative *global* paradigm of trade and proliferation controls is proposed.

I. Inter-State Relations as a Consideration

Related to the omission of long-term strategic vision, is the necessity of inter-State coordination for effective reform of U.S. export controls at both the international and domestic level. Central to the need for coordination is the legal right of sovereign States to pursue independent export control policies, policies that may either threaten or be perceived as a security threat by the United States. This independence of States results in uncertainty with regards to future export control policy. As a result, whether a particular approach or proposal *aforementioned* in this Chapter is adopted by the U.S., and how it is implemented, is a choice that is partially dependent on the actions of other States.

The issue of Comsats is extremely particular in the respect, especially with regards to China. As discussed in Chapter 2, space technologies are inherently dual-use and the most important export control characteristic is not inherent in the space goods and technologies themselves, but instead is derived from the strategic advantages space-based applications can provide to military and intelligence operations. The future of U.S. Comsat (and more broadly space technology) export controls are directly linked to the outer space military and strategic posturing and activities of other States.

Any future reforms, either at the policy, process, or strategic level, will need to factor in the uncertainty of other State action and the necessity of a pro-active international diplomatic initiative to complement domestic reform measures. Through diplomacy the U.S. can seek to shape foreign State export control policy towards greater convergence with U.S. policy.

J. Summary & Conclusions

After completing the case study of the U.S. Comsat control regime, it is concluded that the United States faces a threshold as to the future of Comsat export controls.

Conflicting reform approaches exist within the U.S. law and policy decision-making structure. The two approaches identified in this Chapter are the Conformity Approach and the Escalation Approach. Working within the current conceptual paradigm of Comsat export controls, it is proposed that the appropriate reform strategy for the United States is to adopt a mixture of the Process, Policy, and Strategic level reforms, integrating both the Conformity and Escalation approaches. Neither approach is mutually exclusive. Congress can selectively apply the Escalation approach with regards to particular destinations and/or end-users (e.g. China) but at the same time liberalize Comsat export controls by moving closer to European regulatory standards.

The most important finding of this Chapter, and indeed the case study, is that there is failure in the discourse to either identify or challenge the current presumptive national centric paradigm of export controls. This lacuna results in policy drift, subjecting the United States and the world community of States to an evolution of international law and relations resulting not from a long-term strategic vision of the future, but instead from the emergent characteristics of the international system. As will be discussed in

Chapter 8, this policy drift fails to consider the legal principles of international space law, in particular those of cooperation and the interests of mankind, as appropriate goals upon which to craft its long-term strategic vision.

K. KEY FINDINGS OF THE U.S. COMSAT EXPORT CONTROL CASE STUDY

1) U.S. Comsat export controls are national centric and operate within a primarily unilateral paradigm in which States seek to maximize their legal discretion in exercising space technology trade and proliferation controls. This national centric paradigm is reflected in the absence of a legally binding supra-national space technology trade and proliferation control.[484]

2) The international system of space technology trade and proliferation controls is appropriately characterized as primarily a voluntary system of non-binding arrangements. States rarely enter into legally binding space technology control agreements, doing so only with their most "trusted" strategic allies.[485] In the special case of EU regional integration, dual-use items are trusted for regulatory coordination, but those items deemed militarily strategic still remain within the legal discretion of the exporting State.[486]

3) The fractured international paradigm of space technology trade and proliferation controls creates an economic dilemma for exporting States. In light of regulatory divergence, exporting States face the choice of either modifying their export controls to meet the less restrictive standards of their export competitors or to absorb the economic costs (i.e. loss of commercial exports) associated with stricter trade controls. This dilemma is exacerbated

[484] *See* Chapter 2 of this thesis: *International Legal Obligations of a State to Control Exports of Spacecraft and Launch Vehicle Technologies.*

[485] *See* Chapter 2 of this thesis: *Export Controls and Sovereign Jurisdictions*, the example of U.S.-Canadian harmonization of export controls. *Also see* the Defense Trade Cooperation Agreements between the U.S. and its closest ally, the United Kingdom. *Treaty between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the United States of America concerning Defense Trade Cooperation.*

[486] *See* Chapter 4 of this thesis: *European Comsat Export Controls.* The ultimate decision on item categorization for items not listed in Council Regulation (EC) No. 428/2009 is at the discretion of the EU Member State. EU Member States retain authority over export authorization for items designated as military technology and equipment.

by the phenomenon of economic globalization which increases international competition and accelerates the rate at which markets respond to changes in costs associated with trade control restrictions.[487]

4) The sustainability of unilateral approaches to space technology trade and proliferation controls is questionable. States with technical superiority can temporarily impose unilateral export restrictions without a concomitant cost to their national economy. But unilateral control restrictions create incentives for foreign States to develop indigenous substitute technologies.[488] In theory, the phenomena of techno-globalization facilitates the indigenous development of substitute technologies by providing foreign States access to human innovation networks that exist beyond the territorial delimitation of exporting States. Furthermore, due to technology advances in transnational human communication networks, the costs associated with benefiting from innovation networks should be lower.[489]

5) The economic benefits from trade, coupled with State divergence on trade controls, results in a fractured international system in which supplier countries may be in direct conflict. This lack of international harmonization results in the possibility of technology proliferation at the unilateral discretion of a State.

6) Current thinking on reform of the U.S. export control system reflects a national centric approach. Notably absent in the discourse is the idea of restructuring the international system of space technology trade and proliferation towards a globalized paradigm.

[487] *See* Chapter 3 of this thesis: *Economic Globalization.*

[488] *See* Chapter 4 of this thesis: *Comparative Analysis* and *Chapter Summary. See also* generally the findings of Chapter 5 of this thesis.

[489] *See* Chapter 3 of this thesis: *Techno-Globalization.*

PART 3: Transcending the Case Study – International Space Law and Policy

In the preceding case study, it was determined that the U.S. approach to Comsat trade and export controls is primarily unilateral and that the U.S. model is indicative of the broader international system of space technology controls. States have significant discretion to determine what space technologies they will develop and trade. While there is, to some extent, inter-State coordination or trade and control, there is no supranational authority to coordinate, regulate, or enforce.

In Part III, this finding from the foregoing case study is elevated to address broader questions of international space law and policy. In particular, Part III explores how our current international system of controls impacts international cooperation in civil space endeavours and the implications under international law.

Chapter VIII

Security and Global Civil Space Cooperation: Space Technology Trade and Proliferation Controls as One Part of the Larger Puzzle

As one part of the larger puzzle of international law, international relations, and our collective human future in outer space, this Chapter examines how the current national centric paradigm of space technology trade and proliferation controls impacts global cooperation in civil space endeavours.

This Chapter begins with an assessment of how the current international regime of space technology trade and proliferation controls impact the ability of States to cooperate internationally on civil space endeavours. Thereafter, it addresses outer space arms control, disarmament, and proliferation and its link to international cooperation and space technology trade and proliferation controls.

International law then becomes the focus of this Chapter. Three distinct international legal obligations are analyzed under the rubric of global space cooperation: the duty to maintain international peace and security, the obligation to promote cooperation and mutual understanding, and the obligation for the exploration and use of outer space to be for the benefit and interests of all countries.

After that, the Chapter transitions to broader questions of international law, international relations, and philosophy. The establishment of a world space organization as well as a complementary global paradigm of space trade and technology controls is proposed, a ‘self-justified’ security dilemma that legitimizes the continuation of unilateral space activity is identified, forecasts are made as to the future of State relations if the current international framework of space technology trade and control perpetuates, and the historical legal-political evolution of State relations and outer space is analogized to Immanuel Kant’s *Cosmopolitan Condition.*

A. The Impact of the Current International Regime of Space Technology Trade and Proliferation Controls on International Civil Space Cooperation

I. The Outer Space Treaty

The *Outer Space Treaty*[490] (OST) is an international agreement that establishes the foundational principles upon which States, and their national entities, undertake space activities. While it is not per se a legal agreement governing space technology and proliferation controls, its principles provide an important contextual starting point for this discussion because its legal rights and obligations generally relate to space endeavours.

The OST can be viewed as an instrument crafted to accomplish two distinct substantive goals. The first is to serve as an arms control and disarmament agreement. At the time of the OST drafting, the major space-faring States (e.g. U.S.A. and U.S.S.R.) were seriously concerned that the nuclear and conventional arms race of the cold war would expand into outer space. To prevent an extension of this arms race into outer space, the space-faring States agreed to the inclusion of Article IV. Article IV of the OST prohibits the deployment of nuclear weapons or weapons of mass destruction (WMD) in outer space and establishes the moon and other celestial bodies as disarmament zones upon which the establishment of military bases, installations and fortifications, the testing of weapons of any type and the conduct of military manoeuvres are forbidden.[491] Combined with the *Antarctic Treaty of 1959* and the *Nuclear Test Ban Treaty of 1963*, the OST was seen as a landmark arms control, disarmament, and non-proliferation agreement.[492]

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[490] *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies* [Outer Space Treaty], signed on 27th January 1967, 18 UST 2410; TIAS 6347; 610 UNTS 205. All space-faring nations, including the U.S., are Parties to this Convention.

[491] Article IV of the *Outer Space Treaty*.

[492] *See*, Presidential Lyndon Johnson Signing Statement to the *Outer Space Treaty* (27 January, 1967), available online at Lyndon Johnson Presidential Library <http://www.lbjlib.utexas.edu/johnson/archives.hom/speeches.hom/670127.asp>.

The second purpose of the OST is to enunciate fundamental guiding principles for State activities in the peaceful exploration and use of outer space. These principles deal with a variety of issues, attempting to encompass the most important aspects of space exploration and use. For the purpose of the analysis in this Chapter, two particular provisions of the OST are most relevant. These are Article I and Article II.

Article 1

The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.

Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies.

There shall be freedom of scientific investigation in outer space, including the moon and other celestial bodies, and States shall facilitate and encourage international co-operation in such investigation.

Article I of the OST has four operative clauses: the *Benefits and Interests Clause, Province of Mankind Clause, Non-Discrimination Clause,* and the *International Cooperation Clause.* For the purposes of assessing the OST as an instrument related to space technology control, this section shall limit analysis to the *Non-Discrimination Clause.* However, please keep in mind that the *Benefits and Interests Clause, Province of Mankind Clause,* and the *International Cooperation Clause* are extremely relevant with regards to the OST as a legal instrument enunciating principled obligations with regards to international cooperation and the maintenance of international peace and security. In subsequent sections of this Chapter, these clauses are assessed under that rubric.

While the *Non-Discrimination Clause* prohibits legal discrimination amongst States in the exploration and use of outer space and guarantees free access to outer space and other celestial bodies, in practice States have failed to provide substantive prohibitions against political, economic, or strategic discrimination, in particular with regards to functional access to outer space and civil space technologies.

In practice only active launching States have the functional technical capability to access outer space, but the general *opinion juris* is that launching States are under no obligation to provide launch services to other States. Nor has the international community established an international organization that provides space launch services on a non-discriminatory basis to all States. Indeed, this lack of an international launch services organization is a manifestation of the failure of States to cooperate and coordinate internationally for space exploration and use. As a result, while it is true that in legal principle outer space is free for the exploration and use of all States, in practice States with launch capability can choose whether or not provide launch services and practically prohibit another State from accessing outer space. In this sense, the *Non-Discrimination Clause* is more like a freedom to use and explore free from interference as opposed to guaranteeing access to outer space.

The limitations of the *Non-Discrimination Clause* also extend to trade in civil space technologies and spacecrafts. State practice confirms that complete discrimination with regards to the sale, purchase, exchange, and trade in civil space technologies and spacecraft is legal. States have exercised complete legal discretion with regards to space technology trade and controls.

Article 2

Outer space, including the moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.

Article II of the Outer Space Treaty prohibits the national appropriation of outer space or other celestial bodies.[493] This prohibition is relevant to space technology export and trade control within the context of international civil and commercial cooperation in the *exploration, use, and exploitation* of outer space and other celestial bodies. It raises interesting questions on whether the use or exploitation of outer space and celestial bodies may necessitate forms of international cooperation that include technology development, exchange, and/or transfer. In practice, this prohibition establishes outer space as a global common, an area in which *utilization* and *exploration* is subject to the principles of international cooperation and peaceful use enumerated in the Outer Space Treaty. But with regards to *exploitation* of outer space, this principle has yet to be significantly tested. No major *in situ* resource exploitation has occurred in outer space. Nor have any structures been erected on the moon or other celestial bodies. It remains to be seen how this principle will evolve as humanity expands its range of space activities towards exploitation and in situ utilization. To date, this principle has not been challenged on the basis of unilateral exploration, use, or exploitation. Commentators have raised the point that future civil space missions, such as crewed missions to Mars or Lunar resource exploitation, will require a refinement of this principle, both in political and legal practice, that may necessitate international cooperation on a level of technical development, exchange, and/or transfer currently not observed in international space cooperation.[494]

In conclusion, the OST provides individual states with basic freedoms to access and explore outer space free from interference or claims of national appropriation and also obligates States to explore and use outer space in the interest of maintaining international peace and security and promoting international co-operation and understanding.[495] There is, however, no obligation to sell, share, transfer, or exchange

[493] Article III of the *Outer Space Treaty.*

[494] *See* Ernst Fasan, "Human Settlements on Planets: New Stations or New Nations" 22 J. Space L. 47 (1997).

[495] Article III of the *Outer Space Treaty.*

space services, goods and technologies, nor is there an obligation to regulate space goods, services, and technologies internationally.

II. General impact of current international space technology trade and proliferation control regime on international civil space cooperation

The current international regime governing international space technology trade and proliferation is minimal. As discussed in Chapter 2, space specific regulation and control on an international level is limited to technologies associated with ballistic missiles and nuclear or WMD delivery systems. Controls of space technologies not directly related to ballistic missiles are coordinated through non-binding international arrangements such as The Wassenaar Arrangement.

This lack of international controls necessitates that each individual State is burdened with the unilateral responsibility of civil and commercial space items and technology trade regulation. To further complicate matters, the dual-use nature of space technologies, including a nexus between space launch vehicles and ballistic missiles, as well as the abundance of military space applications and other military related benefits derived from space exploration, use, and technologies, creates additional technology proliferation and related security concerns for States.[496] The result is a non-harmonized, fractured system of trade and proliferation controls where each State imposes its own regulatory standards and makes unilateral decisions on exports, trade, and exchange.

This lack of an internationally harmonized control and proliferation regime also creates a political atmosphere of mistrust. Without international coordination, States are rightfully concerned about unauthorized technology transfers and the utilization of space technologies by foreign States/actors to improve ballistic missiles and other space applications. The absence of international regulations, compliance, verification, and enforcement mechanisms compels States to restrict international civil and commercial space endeavours to the extent necessary to protect bona fide national security interests.

[496] *See* Chapter 2 of thesis.

i. International civil space cooperation

Today, there is no *world space organization* (WSO) guiding any aspect of peaceful human exploration or use of outer space. Instead, outer space is governed by a series of international treaties[497] representative of a de-centralized approach towards human exploration and use of outer space, an approach that articulates basic principles (e.g. rules of the road) amongst space-faring nations, but does not mandate cooperation or coordinated efforts except in exceptional cases (e.g. the rescue and return of astronauts).[498] States do cooperate on civil space activities, on an ad-hoc, bilateral and/or multilateral bases, but without international centralized or interdependent planning, development, or operation. This current approach to international cooperation is reflective of the overall international space security environment.

While there is no world space organization per se, there are various international organizations whose mandates cover particular aspects of space activity.[499] Typically these organizations handle specific issues that arise from their historical prerogative over a terrestrial matter that happens to incorporate a space application.[500] For example, the International Telecommunication Union (ITU) is an international organization responsible for coordinating international radio frequency allocations, including allocations for satellite communications. The ITU, dating back to 1865, did not originally have satellite communications within its purview, but instead drew up procedures and

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[497] The *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space* is the principle international instrument governing activity in outer space. It is complemented with four subsequent treaties: *Rescue and Return Agreement, Registration Convention, Liability Convention,* and *Moon Agreement.* With the exception of the *Moon Agreement,* the treaty regime governing outer space has received broad international support.

[498] *See Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space*, Apr. 22, 1968, 19 U.S.T. 7570, 672 U.N.T.S. 119 [hereinafter Rescue Agreement].

[499] These include the International Telecommunications Union (ITU), the International Maritime Organization (IMO), and the World Meteorology Organization (WMO). For an excellent review of international, regional, and national organization affecting space activities, *See* Stephen Doyle, "International space plans and policies: future roles of international organizations" 18 J. Space L. 123 (1990).

[500] *See* Ram S. Jakhu, J. L. Magdelénat and H. Rousselle, "The ITU Regulatory Framework for Satellite Communications: An Analysis of Space WARC 1985" *International Journal*, Vol. 42(2) The Politics of International Telecommunications (Spring, 1987), pp. 276-288.

made frequency allocations for space based systems when the need arose in 1959 and 1963. Since that time, the ITU has developed a sophisticated organizational structure to handle the coordination of space-based systems. Like other international organizations involved with space activities, while the ITU is a satisfactory organization for resolving issues of spacecraft radio frequency coordination, it is not able to facilitate international civil space cooperation beyond this specific subject area. Crucially, as will be discussed in greater detail *infra*, current international organizations cannot and do not facilitate international civil space mission coordination or operation.

In lieu of an international space organization, national space agencies enter into inter-agency arrangements to facilitate international civil space cooperation.[501] There are a number of such special arrangements.[502] One example of a successful inter-agency arrangement is the *Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters.*[503] The purpose of this Charter is to provide a unified system of space data acquisition and delivery to those affected by natural or man-made disasters.[504] Since its enactment, the Charter has been activated hundreds of times and in many ways as an example of how States can achieve international cooperation within the current international paradigm.[505] It has "opened the door to those countries world-wide affected by disasters to have access to critical space assets" and "brought together divergent bodies contributing to a reinforced network of

[501] It has been hypothesized that the development of greater State reliance on inter-agency arrangements reflects, in part, the decline of United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) as an effective body to facilitate cooperation. *See* Ram Jakhu, "The Effect of Globalization on Space Law" in Stephen Hobe, ed. *Globalisation – the State and International Law* (Franz Steiner Verlag, 2009) at 75-77.

[502] These include the Inter-Agency Space Debris Coordination Committee (IADC), the Committee on Earth Observation Satellites (CEOS), and the International Committee on Global Navigation Satellite Systems (ICG).

[503] *Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters*, available online at Disaster Charter Homepage <http://www.disasterscharter.org/web/charter/charter>.

[504] J. Bessis, J. Bequignon, & A. Mahood, "The International Charter 'Space and Major Disasters' Initiative" 54(3) *Acta Astronautica* 183 (2004).

[505] Atsuyo Ito, "Issues in the Implementation of the International Charter of Space and Major Disasters" 21(2) Space Policy 141 (2005).

disaster relief."[506] But the nature of its success resides in the fact that the arrangement conforms to the current international legal and political national security environment. First, concerns regarding unauthorized technology transfers or transfers of potential military application are mitigated due to the nature of the exchange (i.e. all that is being exchanged is optical and remote sensing data/information of a particular geographic area subject to a natural disaster, not the spacecraft or signal/data processing technology). Second, risk regarding shared data being used for military application against the provider of data/information is minimal (i.e. the nature of the data/information and the location of analysis is extremely unlikely to be used by a foreign adversary for military applications). Third, the arrangement is completely voluntary, as each agency decides what and how to participate as is deemed in its national interest. Most importantly, no technology is shared and there are no internationally operated spacecraft or information centers. Everything involving this arrangement remains within the complete jurisdiction and control of the individual States and only data/information is exchanged.

Inter-agency cooperation also occurs in the field of civil space mission development and operation. This cooperation encompasses a variety of mission types, ranging from small-scale micro-satellite launching agreements, to cooperative scientific spacecraft development and operation, and even complex multi-agency manned operations. International cooperation on civil space missions raises unique political and security risks for cooperating States. Political risks arise because partnership is extremely public and can be used by politicians to promote international and domestic agendas. Security risks arise because mission collaboration almost inevitably involves some level of unauthorized technology transfer risk. The nature of an inter-agency mission partnership requires that parties involved on co-mission development and/or operation must, at a minimum, exchange information, knowledge, and/or technical goods to ensure proper integration and operation of their respective equipment and personnel.

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[506] Atsuyo Ito, "Issues in the Implementation of the International Charter of Space and Major Disasters" 21(2) Space Policy 141 (2005) at 148.

The largest civil space inter-agency cooperative project ever undertaken is the *International Space Station* (ISS). While the size of this project is not representative of the vast majority of inter-agency cooperative ventures, it does provide useful insight on how States have structured complex international civil space ventures involving sophisticated space technologies in lieu of a centralized international space organization.

The ISS emerged in the 1990s from a U.S. unilateral program dubbed *Space Station Freedom/Alpha*. In the aftermath of the Cold War, unable to sustain Congressional funding support and sensing political, financial, and security gains by including international partners, the Bush Sr. & Clinton administrations entered into negotiations with Europe, Japan, Canada, and Russia for a collaborative international space station.[507] Ultimately, these States agreed to engage in an international collaborative civil space station. Governing this venture is an international multilateral treaty, the *ISS Intergovernmental Agreement*[508] and subsidiary bilateral Memoranda of Understandings (MOU) between NASA and each of the associated space agencies.

The *ISS Intergovernmental Agreement* reflects the State's prerogatives in maintaining unilateral control over their respective contributions. All Partners retain jurisdiction and control of their respective space station elements and personnel,[509] ownership of equipment and elements,[510] and management for their own programs (subject to overall project management and coordination by NASA).[511] Regarding technology, Partners design and develop their own elements and equipment and are responsible for their operation.[512] In practice, Partners are only obligated to share

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[507] Originally the U.S. was going to undertake a space station named *Freedom*. This project was replaced in 1993 with the *International Space Station.* Russia was later added as partner to the *ISS.*

[508] *Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, The Government of Japan, The Government of the Russian Federation, and the Government of the United States of America concerning cooperation on the civil international space station* [ISS Agreement], (29 January 1998).

[509] Article 5 of the *ISS Agreement*.

[510] Article 6 of the *ISS Agreement*.

[511] Article 7 of the *ISS Agreement.*

[512] Article 8 and Article 10 of the *ISS Agreement.*

technical information as is necessary to ensure proper integration and operation of the respective modules. There is no mandated joint-development, sharing, transfer, or exchange of technology.

Participation in the ISS is not inclusively international. If one defines “international” as involving the international community as a whole (i.e. “global”), then the ISS is more accurately described as a multinational project amongst eight Participating Space Agencies. China and India, two major space-faring States, are not participants in the project and nor are there any States participating who are not Space Agency partners. This means almost 180 States are neither participating nor represented in the ISS project. If the ISS is an exemplar for future “international” space missions – what does that mean for the international community as a whole?

The exclusionary nature of inter-agency mission cooperation, as represented by the ISS Agreement, reveals that civil space activities undertaken without a centralized international organization are particularly influenced by domestic political considerations, perhaps at the cost of creating truly global international missions. Inter-agency missions face the risk of having their funding, mission planning, mission development, mission operations, and partnership selection being subject to the domestic constituent concerns of the respective State partners. This raises the likelihood of an inter-agency mission serving the interests of the Partners, but not necessarily reflecting the interests of the international community as a whole. When a national space agency has to report to a national political leader, it crafts its mission to suit the immediate domestic political needs of its State. But is this the model we, as a global community, want to adopt for the future use and exploration of outer space? Is such a model failing to fully utilize human and technological resources internationally? And will such a model inspire the international community, not just select members, to believe in and contribute to the peaceful use and exploration of outer space?

ii. International Commercial Launch Services

International commercial launch services are offered on a case-by-case basis by launch service providers. There is no public international consortium that provides launch services to the international community. Instead, launch companies operate either as private or government-owned operations that sell their launch services on the international market. Each launch services company has a proprietary launch vehicle or vehicles that can offer different payload and orbital delivery capabilities.

In accordance with Article VI of the Outer Space Treaty, every commercial launch service provider is subject to the authorization and continuing supervision of the State in which the launch company operates and launches. In practice, the State in which a launch company operates grants regulatory approval and oversight for launch vehicles and payloads and also coordinates with the ITU and the U.N. Secretariat on spacecraft radio frequencies and registration.

Technology trade and proliferation controls play an important role in the international commercial launch industry. As discussed in earlier Chapters, the launch vehicle and the payload will be subject to national export and trade controls. Due to the sensitive nature of launch vehicle ballistic technologies, launch vehicles themselves are, as a general rule, not traded on the international market. Only the service of launching a particular payload is sold. A handful of States offer commercial launch services and these States have all developed indigenous ballistic missile technologies.[513] Indigenous ballistic missile technologies have been 'modified' or 'evolved' to fit the demands of commercial launching and have been complemented as needed with original technologies related specifically to spacecraft launch and delivery.

[513] Those States with proven space launch capabilities are: The United States of America, Russia, France, China, India, and Japan.

The only exception to international commercial trade and cooperative ventures in launch vehicle technologies has been the *SeaLaunch Corporation*.[514] *SeaLaunch* consists of four international corporate partners: Boeing (U.S.A.), K.B. Yuzhnoye (Ukraine), RSC Energia (Russia), and Kvaerner Maritime (Norway).[515] These four companies, led by Boeing, work together, each providing a unique technical contribution, to complete a sophisticated sea-based commercial launch service. The operation of this company requires extensive export control and technology transfer regulatory compliance, in particular U.S. regulatory compliance for Boeing.

A distinct issue related to trade and proliferation of space technologies is the approval of spacecraft launch on foreign launch vehicles. Not all States permit the launch of their spacecraft with international commercial launch service providers. The lack of an international public launch service provider raises the specter of unauthorized technology transfers when a foreign launch service provider launches a national spacecraft. Traditionally, this security concern was remedied on an ad-hoc, bilateral basis, between spacecraft exporting States and launch service provider States. However, as evidenced by the current U.S. boycott of Chinese commercial launch services, the international market remains fractured. Not all spacecraft manufacturing States and launch service providers have reached accord. States, unable to unilaterally ensure adequate protection against unauthorized transfer, and without an international space technology trade and proliferation regulation, compliance, verification, and enforcement regime upon which to rely, remain justified in maintaining unilateral trade restrictions.

Interestingly enough, this discriminatory treatment of launch services is not a violation of the WTO. While GATS encompasses the trade in transportation services, including commercial space launch services, two exceptions to the application of MFN apply. First, Article II exceptions for space transportation services have been upheld by

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[514] While there are many companies that sell, on behalf of the launch service provider, particular launch services, these types of companies are essentially agents and do not contribute or participate in the physical trade or operation of launch vehicle technologies and services.

[515] *See* Joosung Lee, "Legal Analysis of SeaLaunch License: National Security and Environmental Concerns" 24(2) Space Policy 104 (2008) at 105.

the WTO. For example, the United States currently exempts space transportation services on the condition that the exception is necessary to "prevent disruption of competition in the international space launch market."[516] The measures inconsistent with GATS MFN are "quantitative restrictions on price" on all disciplines in certain bilateral agreements on the launch of satellites in the international commercial space launch market.[517] These Article II exceptions apply to the actual pricing and trade of the launch service providers. GATS security exceptions also apply for discrimination amongst launch service providers with regards to spacecraft export approval. Article XIV(b) provides a catchall that "nothing in the GATS agreement shall be construed to prevent any Member from taking any action it considers necessary for the protection of its essential security interests."[518] Given the national security sensitivity of space technologies, States have a very strong argument in favor of exercising Article XIV(b).

B. Outer Space Arms Control, Disarmament, and Proliferation: Its link to International Cooperation and Space Technology Trade and Proliferation Controls

International cooperation in civil space endeavors is directly related to the issue of outer space arms control, disarmament, and proliferation – key indicators of the international space security environment. This link exists because sophisticated/high-levels of international cooperation requires States to have access to, develop, share, and/or exchange space goods and technologies. The international space security environment is particularly relevant for States in assessing whether or not this type of cooperation is in their national interests. Without international arms control, disarmament, and proliferation controls, the international space security environment is more likely to create dilemmas for State seeking to engage in international cooperative

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[516] *See* Article II of *WTO General Agreement on Trade in Services* (GATS) Most Favored Nation (MFN) Exemption List for the United States of America (August 2010), Sector: "Transportation Services: Space Transportation."

[517] *See* Article II of *WTO General Agreement on Trade in Services* (GATS) Most Favored Nation (MFN) Exemption List for the United States of America (August 2010), Sector: "Transportation Services: Space Transportation."

[518] Article IV(b)(2) of *WTO General Agreement on Trade in Services* (GATS).

ventures. For example, the absence of space arms control and verification measures increases the likelihood of other space-faring States being considered strategic military competitors. States are not inclined to engage in cooperation with strategic military competitors. Furthermore, the inclusion of States with less sophisticated space technology and knowledge raises concerns for the leading State partner of possible technology proliferation and unauthorized re-transfers. Without a comprehensive international space technology control regime, co-developing, sharing, and transferring space technical knowledge and goods carries particular security risks.

The four primary foci of modern outer space arms control, disarmament, and proliferation efforts are anti-satellite weapons (ASATs), space-based ballistic missile defense systems (SBBMD), ballistic missile/launch vehicle proliferation (e.g. WMD ballistic delivery systems), and unauthorized technology transfers and the use of space technologies for the development of ballistic missiles, space weapons, or other space-based military applications. Together, these four issues define the modern legal and political international space security environment.

I. Arms Control, Disarmament, and Proliferation Agreements and/or Arrangements associated with Outer Space

There are five key arms control, disarmament, and proliferation agreements/arrangements currently in force: (1) Outer Space Treaty, (2) LTBT, (3) Environmental Modification Agreement, (4) MTCR, and (5) Wassenaar. In addition, the AMB, while no longer in force, is an important historical exemplar.

i. **Outer Space Treaty**: As discussed *supra,* one objective of the OST is arms control disarmament. Article IV of the OST prohibits the deployment of nuclear weapons or weapons of mass destruction (WMD) in outer space and establishes the moon and other celestial bodies as disarmament zones upon which the establishment of military bases, installations and fortifications, the testing of weapons of any type and the conduct of military manoeuvres are forbidden.[519]

To implement these measures, the OST contains several transparency and confidence building mechanisms. First, States agree to inform the U.N. Secretary General, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of space activities. In conjunction with the Registration Convention, States agree to provide basic information on launched space objects, including general function, orbital parameters, territory of launch, and date and time of launch.[520] Second, all stations, installations, equipment and space vehicles on the Moon or other celestial bodies are open for inspection on the basis of reciprocity.[521] Third, states shall consider, on the basis of equality, any requests to observe the flight of space objects launched.[522]

Beyond these transparency and confidence building measures, the OST is silent. No verification mechanism is provided, so it is implicit that verification of the agreement is to be done by national means of verification. Beyond the general provisions of international law as enumerated for in Article III of the OST, there is no provision for States to seek redress for suspected violations, dispute resolution, or enforcement.[523]

ii. **Limited Test Ban Treaty of 1963**: The Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (Limited Test Ban Treaty) undertakes to prohibit, to prevent, and not to carry out any nuclear weapon test explosion, or any other nuclear explosion, in the atmosphere;

[519] Article IV, *Outer Space Treaty.*

[520] Article IV, *Registration Convention.*

[521] Article XII, *Outer Space Treaty.*

[522] Article X, *Outer Space Treaty.*

[523] *See* Michael Mineiro, “The United States and the Legality of Outer Space Weaponization” 33 Annals of Air & Space Law 441 (2008) at 464.

beyond its limits, including outer space, or under water, including the territorial high seas.[524] The principal aim of this agreement is to obtain the "speediest possible achievement of an agreement on general and complete disarmament" and put "an end to the contamination of man's environment by radioactive substances."[525] It serves as an outer space arms control agreement to the extent it prohibits testing of nuclear devices, or any nuclear explosion, including explosion for peaceful purposes, in outer space.

iii. **Environmental Modification Agreement**: The Environmental Convention prohibits any State Party from engaging in military or any other hostile use of environmental modification techniques having widespread, long-lasting or severe effects as the means of destruction, damage or injury to any other State Party.[526] As used in this Convention, the term 'environmental modification technique' refers to "any technique changing the deliberate manipulation of natural processes – the dynamics, composition, or structure of the Earth, including its biota, lithosphere, hydrosphere, and atmosphere, or outer space". The use of space weapons employing environmental modification techniques having widespread, long-lasting or severe effects is prohibited. The deployment of a space weapon capable of such environmental modification may be considered a violation of the principle *pacta sunt servanda*, an act in bad faith undermining the purpose and objective of the treaty.

iv. **Missile Technology Control Regime (MTCR) and Hague Code of Conduct (HCOC)**: The Guidelines for Sensitive Missile-Relevant Transfers

[524] *Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water* [Limited Test Ban Treaty], signed at Moscow August 5, 1963, 480 UNTS 43 [Limited Test Ban Treaty]. Ratification advised by U.S. Senate September 24, 1963; Ratified by U.S. President October 7, 1963; U.S. ratification deposited at Washington, London, and Moscow October 10, 1963; Proclaimed by U.S. President October 10, 1963.

[525] Preamble, *Limited Test Ban Treaty.*

[526] *Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques* [Environmental Convention], signed in Geneva May 18, 1977 1108 U.N.T.S. 151. Entered into force October 5, 1978; Ratification by U.S. President December 13, 1979; U.S. ratification deposited at New York January 17, 1980.

(MTCR) is a non-binding political arrangement that coordinates controls of goods and technology amongst “key suppliers” to protect against transfers that could make a contribution to delivery systems, other than manned aircraft, for weapons of mass destruction. This includes rocket systems, including space launch vehicles and sounding rockets. The MTCR rests on adherence to common export policy guidelines (the MTCR Guidelines) applied to an integral common list of controlled items (the MTCR Equipment, Software and Technology Annexes).[527] All MTCR decisions are taken by consensus, and MTCR partners regularly exchange information about relevant national export licensing issues.[528]

In practice the MTCR does little beyond articulating basic methods and standards of review for licensing the export of items and technical knowledge that could make a contribution to WMD delivery systems (other than manned aircraft).[529] The regulation and implantation of export controls, as well as the “decision to transfer,” remains “the sole and sovereign judgment” of national governments.[530] Except for a general obligation to “exchange relevant information [as necessary and appropriate] with other governments applying the [MTCR] Guidelines,” the MTCR provides no transparency, verification, or enforcement mechanisms. MTCR Guidelines specifically state that the regime is “not designed to impede national space programs or international cooperation in such programs as long as such programs could not contribute to delivery systems for weapons of mass destruction.”[531]

The Hague Code of Conduct against Ballistic Missile Proliferation is aimed at bolstering efforts to curb ballistic missile proliferation worldwide

[527] MTCR website <http://www.mtcr.info/english/>.

[528] MTCR website <http://www.mtcr.info/english/>.

[529]MTCR website <http://www.mtcr.info/english/guidetext.htm>.

[530] MTCR website <http://www.mtcr.info/english/guidetext.htm>.

[531] MTCR Guidelines <http://www.mtcr.info/english/guidelines.html>.

and to further delegitimize such proliferation.[532] The HCOC consists of a set of general principles, modest commitments, and limited confidence-building measures.[533] It is intended to supplement, not supplant, the Missile Technology Control Regime (MTCR), and is administered collectively by all of the Subscribing States.[534] As it relates to launch vehicle technology export control, Subscribing States must "exercise the necessary vigilance in consideration of assistance to space launch vehicle program in any other countries" and promote the "non-proliferation" of ballistic missiles capable of delivering weapons of mass destruction.[535]

v. **Wassenaar Arrangement**: The Arrangement is applicable to conventional arms and dual-use technologies set forth in its List of Dual-Use Goods and Technologies and in its Munitions List. Participating States must notify transfers and denials of listed items. The Dual-Use List has two annexed categories: Sensitive and Very Sensitive Items. Certain space technologies, including satellite technologies, are listed as dual-use goods and technologies, sensitive and very sensitive. All measures undertaken with respect to the Arrangement are in accordance with national legislation and policies and are implemented on the basis of national discretion.[536] As a result Wassenaar's primary usefulness is as an export control transparency arrangement.

[532] *See The Hague Code of Conduct Against Ballistic Missile Proliferation* (HCOC) U.S. State Department Fact Sheet, <http://www.fas.org/asmp/resources/govern/ICOC-6January2004.html> (Last accessed on 22 September 2009).

[533] *See* HCOC U.S. State Department Fact Sheet, <http://www.fas.org/asmp/resources/govern/ICOC-6January2004.html> (Last accessed on 22 September 2009).

[534] *See* HCOC U.S. State Department Fact Sheet, <http://www.fas.org/asmp/resources/govern/ICOC-6January2004.html> (Last accessed on 22 September 2009).

[535] *The Hague Code of Conduct Against Ballistic Missile Proliferation* (HCOC) (formally brought into effect on 25 November 2002).

[536] *Wassenaar Arrangement* at Scope, para.3.

vi. Anti-Ballistic Missile (ABM) Treaty:[537] The ABM Treaty, which is no longer in force, was a bilateral arms control agreement between Russia and the United States. Relevant to outer space, the ABM Treaty prohibited the development, testing, or deployment of space-based ABM system and components. To provide assurance or compliance with the Treaty, State Parties relied on national technical means of verification.

II. Lacuna in the Current Framework of Arms Control, Disarmament, and Proliferation Agreements and/or Arrangements

The current international framework has lacuna which contribute to an international space security environment non-conducive to international civil space cooperation. In order to implement a more comprehensive international control system for civil and commercial space goods and technologies, the lacuna associated with outer space arms control, disarmament, and proliferation need to be addressed because the underlying technologies supporting outer space military application are intimately related to civil and commercial application. States are loath to engage in international cooperative civil space ventures that expose them to risks of unauthorized technology transfer and/or use. Resolution of arms control, disarmament, and proliferation lacuna will serve to strengthen the legal-political environment in which international civil space cooperation must occur, mollifying concerns of authorized transfer and/or use.

The following lacunas are illustrative of unresolved issues that currently deter international civil space cooperation:

i. **Anti-Satellite Weapons (ASAT):** There is no international agreement or arrangement prohibiting or controlling the development, deployment, or

[537] *Treaty Between the United States of America and the Union of Socialist Republics on the Limitation of Anti-Ballistic Missile Systems* [AMB Treaty] (Entered into Force on 3 October 1972; Terminated by unilateral withdrawal by the United States on 13 June 2002).

use of ASATs. As evidenced by the 2007 Chinese FY-1C ASAT test, ASAT technology proliferation is a reality and is considered a serious threat to the international space environment.[538] It is important to note that the current U.S. policy is not to engage China in international civil space cooperative ventures.[539]

ii. **Space-based Weapons**: With the exception of weapons-of-mass-destruction, there is no international arrangement or agreement prohibiting or controlling the development, deployment, or use of space-based weapons.[540] States are free to deploy space-based weapons, so long as they are not weapons-of-mass-destruction (WMDs).[541]

iii. **Technology Proliferation Controls**: There is no international control system for the proliferation of spacecraft technologies per se (only for the control of WMD delivery systems – e.g. missiles). There is no international system to regulate the application of civil and commercial space technologies to prevent military production or use.

iv. **Civil and Commercial Launch Vehicle Programs**: There is no international system to verify civil and commercial launch vehicle programs are not being used to complement or supplement military ballistic missile programs. Likewise, there is no international incentive based program to support States participation in civil and commercial launch vehicle programs while controlling against military programs. This

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[538] *See* Michael Mineiro, "FY-1C and USA-193 ASAT Intercepts: An Assessment of Legal Obligations under Article 9 of the Outer Space Treaty" 34(2) Journal of Space Law 321 (2008).

[539] *See* Theresa Hutchins and David Chen, "Forging a Sino-US Grand Bargain in Space" 24(3) Space Policy 128 (2008).

[540] *See* Michael Mineiro, "The United States and the Legality of Outer Space Weaponization" 33 Annals of Air & Space Law 441 (2008) at 452-263.

[541] *See* Michael Mineiro, "The United States and the Legality of Outer Space Weaponization" 33 Annals of Air & Space Law 441 (2008) at 452-463.

lack of transparency on indigenous space launch programs generates mistrust and uncertainty amongst members of the international community, inhibiting their willingness to engage in cooperative space endeavors.[542]

v. **International Regulatory Agency**: There is no international agency to promote the peaceful use of space technologies and to inhibit its use for military purposes. While there are organizations to control the use of nuclear and chemical technologies, outer space technologies have no analog.[543] Likewise, there are no international regimes with independent verification mechanisms to administer safeguards that ensure that spacecraft, space launch vehicles, and other space goods and technologies are not used in such a way as to further any military purpose.[544]

vi. **Outer Space Militarization:** There are few international legal restrictions on the military 'use' of outer space.[545] So long as the military use of outer space is non-aggressive and does not violate the *Outer Space Treaty* prohibition against military use of celestial bodies,[546] States are free to use

[542] During the development of India's space launch vehicle during the 1990s, the U.S. boycotted civil space cooperation. More recently, the development by Iran of a space launch vehicle has raised concern amongst certain space-active members of the international community.

[543] Consider the International Atomic Energy Agency (IAEA) and the Organization for the Prohibition of Chemical Weapons (OPCW).

[544] *See International Atomic Energy Agency Statute*, Article 3(5): "[The IAEA is authorized] To establish and administer safeguards designed to ensure that special fissionable and other materials, services, equipment, facilities, and information made available by the Agency or at its request or under its supervision or control are not used in such a way as to further any military purpose; and to apply safeguards, at the request of the parties, to any bilateral or multilateral arrangement, or at the request of a State, to any of that State's activities in the field of atomic energy."

[545] *See* Michael Mineiro, "The United States and the Legality of Outer Space Weaponization" 33 Annals of Air & Space Law 441 (2008).

[546] Article III, *Outer Space Treaty*: "States Parties to the Treaty undertake not to place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction, install such weapons on celestial bodies, or station such weapons in outer space in any other manner. The Moon and other celestial bodies shall be used by all States Parties to the Treaty exclusively for peaceful purposes. The establishment of military bases, installations and fortifications, the testing of any type of weapons and the conduct of military maneuvers on celestial bodies shall be forbidden. The use of military personnel for

outer space for military purposes. "Concern [with the militarization of outer space] is based on the increasing application of military space systems to support terrestrial combat operations, and the significant disparities in such capabilities of modern weapon systems. Military satellites are of increasing relevance to the contemporary battlefield."[547]

vii. **Lack of Intent Clarification and Dispute Resolution Mechanisms:** Under current international law, States can deploy weapons in outer space. While legal limitations exist on the type of weapons that may be deployed and the scope of such deployment, in some instances the extent of these limitations is unclear. This lack of clarity may lead to a dispute which threatens the peace and security of the international community. Such a dispute may occur if space weaponization activities are conducted within the lacunae of the current space law regime.

The current legal regime requires little, if any, transparency and provides no particular mechanisms for dispute resolution. The reporting requirements established under the Registration Convention provide very little transparency, allowing States to effectively conceal whether or not a registered object is a space weapon.[548] The Outer Space Treaty does provide for the application of international law and the *United Nations Charter*. Thus, in case of a dispute relating to outer space weaponization, in accordance with article 2(3) of the Charter, States are obligated to

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scientific research or for any other peaceful purposes shall not be prohibited. The use of any equipment or facility necessary for peaceful exploration of the Moon and other celestial bodies shall also not be prohibited."

[547] U.N. Centre for Disarmament Affairs, *Study on the Application of Confidence Building Measures in Outer Space,* A/48/305 (1994) at 50.

[548] I.A. Vlasic, "Space Law and the Military Applications of Space Technology", in N. Jasentuliyana, ed., *Perspectives on International Law* (Kluwer Law International: Boston, 1995) at 489. "All they are obliged to do, according to the key Article IV, is to submit their reports "as soon as practicable", containing information designed *not* to reveal the true nature of the mission." [Vlasic]

negotiate in good faith under article 33 of the Charter.[549] However, in the event that negotiations fail, few other methods of dispute resolution are available. While Article IX of the *Outer Space Treaty* calls for international consultations, it is unclear whether the deployment of a space weapon alone triggers this obligation and even if it does, to what extent such consultations are to be taken.[550]

C. The Maintenance of International Peace and Security

Up until this point in the Chapter, we have examined how the current international regime of space technology trade and proliferation controls impact the ability of States to cooperate internationally on civil space endeavours, as well as the nexus between arms control, disarmament, proliferation and international cooperation. This examination has explicitly contended that the impact of the current international framework inhibits international civil space cooperation. To support this contention, specific examples were given of current international cooperative ventures, the limitations of these ventures, and also descriptions of the lacunae in international law that contribute to the international space security environment in which States operate. Notably absent has been the central question of whether or not the international community needs greater cooperation in outer space. While it has been implied that there is necessity for greater cooperation, it has not been articulated as to why.

Central to the challenge of determining a necessity is establishing an "objective" metric upon which the community can agree. In this section, it is proposed that one appropriate metric to assess the need for international space cooperation is the principle of "international peace and security." On this basis, it is contended that international civil space cooperation is obligated in order facilitate collective measures that are necessary to maintain international peace and security.

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[549] Nandasiri Jasentuliyana, *International Space Law and the United Nations* (Kluwer Law International: Hague, 1999) at 218.

[550] *See* Michael Mineiro, "FY-1C and USA-197 ASAT Intercepts: An Assessment of Legal Obligations under Article 9 of the Outer Space Treaty" 34(2) Journal of Space Law 321 (2008).

I. General Duty to Maintain International Peace and Security

The maintenance of international peace and security is an issue without geospatial bounds and this principle is as applicable on Earth as it is in outer space. A fundamental legal principle in international space law is that States must undertake their activities in outer space in the interest of "maintaining international peace and security."[551] Underlying this principle is a deeply rooted ideal that the maintenance of international peace and security is *a priori* to our collective human interests.

The general understanding of international peace and security derives from World War II and the United Nations Charter. Founded in the tumultuous years of World War II, the U.N.'s primary mission is to "maintain international peace and security."[552] To that end, the U.N. and her Member States undertake "collective action measures for the prevention and removal of threats to the peace, and for the suppression of acts and aggression or other breaches of the peace, and to bring about by peaceful means, and in conformity with the principles of justice and international law, adjustment or settlement of international disputes or situations which might lead to a breach of peace."[553]

The errors of World War I and World War II, the historical use of armed conflict to resolve disputes, and the failure of the Kellogg-Briand Pact were the impetus behind this general understanding of international peace and security. But in the sixty-five years since the founding of the United Nations, the idea of international peace and security and its maintenance by the international community has evolved well-beyond the scope of inter-State conflict resolution. Under the auspices of maintaining international peace and security, the United Nations and her Member States engage in actions as diverse as intra-State humanitarian intervention,[554] environmental protection,[555] and international

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[551] Article III, *Outer Space Treaty.*

[552] Article 1(1), UN Charter.

[553] Article 1(1), *United Nations Charter*.

[554] *See* Peter Jakobsen, "National Interest, Humanitarianism or CNN: What Triggers UN Peace Enforcement After the Cold War?" 33(2) Journal of Peace Research 202 (1996). *See also*, Adam Roberts, "Humanitarian War: Military Intervention and Human Rights" 69(3) International Affairs 429 (1993).

criminal tribunals.[556] Through their actions, the international community is recognizing that the maintenance of international peace and security is a concept that should evolve over time to meet the challenges of the current generation and that breaches and threats to international peace and security need not necessarily take the form of inter-State armed conflict.[557] Instead, the determination of what constitutes a breach and/or threat to peace and security has shifted to an assessment of the underlying impact and/or effects of the particular issue and/or event in question. State practice indicates that so long as it is determined that an issue threatens to destabilize the broader goal of international peace and security, the international community may exercise collective measures.[558] This assessment holds true even if the issue and/or event only destabilizes peace and security at a local or regional level.[559]

II. Outer Space and International Peace and Security

Outer space is also experiencing an evolution in the conception of what constitutes a breach or threat of international peace and security and how the international community should respond. Traditionally the question of outer space and threats to international peace and security focused on possible issues of friction that may arise

[555] *See* Ole Weaver, "Peace and Security: Two Evolving Concepts and Their Changing Relationships" in Hans Brauch Ed., *Hexagon Series on Human and Environmental Security and Peace Vol.3: Globalization and Environmental Challenges* (New York: Springer, 2008) at 99-112.

[556] *See* Immi Tallgren, "The Sensibility and Sense of International Criminal Law" 13(3) European Journal of International Law 561 (2002) at 567. *See also*, U.N. Security Council Resolutions S/Res/808 (1993) and S/Res/827 (1993) on the establishment of an International Criminal Tribunal for the Former Yugoslavia.

[557] *See* Paul Taylor, "The United Nations in the 1990s: Proactive Cosmopolitanism and the Issue of Sovereignty" 47(3) Political Studies 538 (1999).

[558] For example, the UN Security Council has passed a number of resolutions supporting this proposition. *See UN Security Council Resolution* S/RES/1267 (1999) [Establishing the "Al-Quida and Taliban Sanctions Committee"]. *See also*, *UN Security Council Resolution* S/RES/1769 (2007) ["Authorizing a Peacekeeping Mission in Darfur"]. *See also*, *UN Security Council Resolutions* S/RES/808 (1993) and S/RES/827 (1993) ["Establishing an International Criminal Tribunal for Violations of International Humanitarian Law in Yugoslavia"].

[559] *See also*, *UN Security Council Resolution* S/RES/1769 (2007) ["Authorizing a Peacekeeping Mission in Darfur"], *Consider that* this peacekeeping mission is primarily with regards to an internal State matter with only direct regional impact on neighboring States.. *See also*, *UN Security Council Resolutions* S/RES/808 (1993) and S/RES/827 (1993) ["Establishing an International Criminal Tribunal for Violations of International Humanitarian Law in Yugoslavia"], *Consider that* this Tribunal is for an intra-state/regional conflict.

between space-faring States, in particular those related to territorial delimitation, claims of "outer space" appropriation, and the use of armed force.[560] Today, new issues are emerging that support broadening the concept of peace and security beyond the traditional inter-State conflict model. These new issues incorporate environmental, security, and economic interests that transcend any particular State, issues that necessitate effective international collective measures for prevention, control, and removal.

III. Examples of Emergent Space-Based Threats to International Peace and Security

i. **Outer Space Arms Race:** The possibility of an outer space arms race has been declared a grave danger to international peace and security by the General Assembly of the United Nations.[561] The danger of an outer space arms race represents an emergent threat to international peace and security. This threat is all the more acute because the current international legal regime applicable to outer space does not address the issue of development or deployment of outer-space and/or terrestrial based weapons whose targets are located in outer space.[562]

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[560] *See* Ian Brownlie, "The Maintenance of Peace in Outer Space" 40 Brit. Y. B. Int'L 1 (1964). In this illustrative article, Sir Ian Brownlie examined what he believed were the primary challenges facing the international community with regards to the maintenance of international peace and security *in outer space.* In accord with the conceptions and concerns of his time, Brownlie wrote on the "the boundary question (of airspace and outer space)," "trespass," "the law of armed conflict," "aggression," "demilitarization," "military use," and "testing of weapons." It is important to note though that Mr. Browlie also had the foresight to address the possibility of relations with other intelligences and the extremely current issue of space assets, the law of armed conflict, and neutrality. *See also*, Robert Jarman, *The Law of Neutrality in Outer Space* [Unpublished LLM Thesis, McGill University Faculty of Law, 2008]. Major Robert Jarman's thesis is an example of the evolution of the traditional inter-state conflict concerns to contemporary issue of space assets and their legal status under the law of armed conflict and neutrality. *See also*, Michel Bourbonniere, "National Security Law in Outer Space: The Interface of Exploration and Security" 70 J. Air L. & Com. 3 (2005) at 55, in which the prevention of an arms race in outer space is addressed – an issue of international peace and security since the 1950s.

[561] G.A. Resolution 64/28 *Prevention of an Arms Race in Outer Space* (2 December 2009), Preamble.

[562] G.A. Resolution 64/28 *Prevention of an Arms Race in Outer Space* (2 December 2009), Para. 2. GA res. *See also* Michael Mineiro, "The United States and Legality of Outer Space Weaponization: A Proposal for Greater Transparency and Effective Dispute Resolution Mechanisms" 33 *Annals of Air and Space Law* 441 (2008). *See also* Jinyuan Su, "Towards an Effective and Adequately Verifiable PPWT" 26(3) Space Policy 152 (2010).

ii. **Space Debris (Space Environmental Degradation):** Space debris poses a danger to the sustainable and continued use of outer space within particular orbits around Earth. Projections of future space debris in outer space include the possibility of cascading debris fields and the complete destruction (e.g. the inability of spacecraft to operate within or through an orbit) of particularly important orbits (such as highly populated GEO and MEO).[563] Given our significant terrestrial reliance on space-based applications (e.g. GPS, Remote Sensing, Telecommunications, Nuclear Verification Safeguards), space debris is an emerging threat to international peace and security to the extent that it has the potential to limit our future ability to use outer space.

iii. **Near Earth Objects (NEO):** NEOs have been identified as a threat to the health, wellbeing, and survival of the human species.[564] International efforts to combat the threat of NEO collisions are developing.[565] As the international community develops more accurate NEO Earth collision threat assessments, combating NEO threats may emerge as a necessity for the maintenance of international peace and security.

IV. The Enhancement of Global Security

Related to the maintenance of international security is the emergent conception of global security, a conception of international security that identifies with the increased interconnectedness of the global community and the necessity of States to address

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563 *See Report of the 2009-2010 Montreal-Cologne International Interdisciplinary Congress on Space Debris* [Unpublished but currently being edited by McGill University Institute of Air & Space Law for publication in 2011].

564 *See* V. Garshnek, et al., "The Mitigation, Management, and Survivability of Asteroid/Comet impact with Earth" 16 Space Policy 213 (2000). *See also* Jessica Tok, ed., *Asteroid Threats: A Call for Global Response* (ASE Report: 2008), available online at <http://www.space-explorers.org/committees/NEO/docs/ATACGR.pdf>.

565 *See* John Remo, "Policy Perspectives from the UN international conference on near-Earth objects" 12(1) Space Policy 13 (1996). *See also* K. Sweet, "Planetary Preservation: The need for legal provision" 15 Space Policy 223 (1999).

transnational security threats. Within the discourse there are different opinions as to the nature and scope of global security commitments. Some advocate for a conception of global security to include human metrics, often termed "human security," that are made of seven components: food security, environmental security, economic security, health security, personal security, community security and political security.[566] Others call for global security to incorporate a post-Cold war approach of "cooperative" security that engenders WMD controls, proliferation controls, transparency, monitoring, and international supported concepts of effective and legitimate intervention.[567] Regardless of the position taken, what is certain is that the international community of States has begun to recognize that traditional concepts of unilateral State security do not effectively function in the modern globalized community of States.

The facilitation of international civil space cooperation and collective utilization of space technologies can enhance global security through the use of space-based applications that advance human interests and combat transnational security threats. This is an important additional justification under the rubric of maintaining international security.[568] Examples of space-based applications that enhance global security include: natural resource management and environmental monitoring [569] information &

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[566] *See* United Nations Development Program (UNDP), *Human Development Report 1994*, (New York: Oxford University Press), Chapter 2 of the report "New dimensions of human security" 22-47. *See also* Kanti Bajpai, "Human Security: Concept and Management" (Kroc Institute Occasional Paper #19, 2000).

[567] *See* Janne Nolan, ed., *Global Engagement: Cooperation and Security in the 21st Century* (Washington, D.C.: The Brookings Institution, 1994) at 10.

[568] *See* George Brown, "International Cooperation in Outer Space: Enhancing the World's Common Security" 3(3) Space Policy 166 (1987). Although an older article, Mr. Brown was far ahead of his time, calling for international space cooperation to advance global security.

[569] These articles illustrate only a few of the many practical space-based applications in the fields of natural resource management and environmental monitoring. *See* W. Balogh, L. Canturk, S. Chernikov, T. Doi, S. Gadimova, H. Haubold & V. Kotelnikov, "The United Nations Programme on Space Applications: Status and Direction for 2010" 26(3) Space Policy 185 (2010). *See also*, M.K.V. Sivakumar & Donald Hinsmen, "Satellite Remote Sensing and GIS Applications in Agricultural Meterology and WHO Satelltite Activities" in *Proceedings of a WMO Training Workshop held July 7-11th in Dehru Dun, India* (AGM-8, WMO/TD-No.1182) (Geneva: WMO, 2004). *See also*, K.D. McMullan, M. Martin-Neira, A. Hahne & A . Borges "SMOS-Earth's Water Monitoring Mission" in Philip Olla ed., *Space Technologies for the Benefit of Human Society and Earth* (Springer, 2009).

communication applications,[570] meteorology,[571] risk reduction and disaster management.[572]

V. Space Technology and International Peace and Security

The needs to effectively combat the aforementioned emerging threats, as well as to enhance global security, will require the international community to engage in collective efforts that at certain times will include international technology sharing, exchange, co-development, transfer, and operation. Each case will have unique requirements as to the method, type, and extent of technology facilitation that should be taken. The following causal categories of technology facilitation are illustrative.

(i) Harmonized Technology Standards: Certain issues will require all spacecraft and personnel to have harmonized technology. Implementing the standardization of technologies will include some degree of technological sharing, transfer, co-development, exchange, licensing, and/or sale. The need for harmonized technology standards will most likely initially arise to combat space debris[573] and to support international crewed space operations.[574]

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[570] Communication is fundamental to the human condition. Space-based communication and information technologies provide a variety of uses to human society that benefit global security. *See* Phillip Olla, "The Diffusion of Information Communication and Space Technology Applications into Society" in Phillip Olla, ed., *Space Technologies for the Benefit of Human Society* (Springer, 2009). *See* Joseph Pelton, "The Economic and Social Benefits of Space Communication: A Global Overview – Past, Present, Future" 6(4) Space Policy 311 (1990).

[571] The first meteorological satellite was launched on April 1, 1960. Since that time, space-based meteorological applications have significantly improved the security and condition of humanity. Today, meteorological applications are being synergized with other applications for additional human benefit. *See* Avery Sen, "The Benefits of Remote Sensing for Energy Policy" 20(1) Space Policy 17 (2004). This article examines the use of meteorological and remote sensing satellites to improve energy policy for the public welfare.

[572] *See* Jesus Gonzalo, Gonzalo Martin-de-Mercado & Fernando Valcarce, "Space Technology Disaster Monitoring, Mitigation and Disaster Management" in in Philip Olla ed., *Space Technologies for the Benefit of Human Society and Earth* (Springer, 2009). *See also* UNOOSA *Space Technology & Disaster Management* online at <http://www.oosa.unvienna.org/oosa/SAP/stdm/index.html>.

[573] For example, the non-binding Inter-Agency Space Debris Coordination Committee (IADC) Mitigation Guidelines describe existing practices that have been identified and evaluated for limiting the generation of space debris in the environment. These guidelines have been developed because the international space-faring community is the process of recognizing the serious threat space debris poses to the continued

(ii) Verification and Compliance Monitoring: The outer space physical environment and the technical considerations of spacecraft will most likely require methods of arms control and disarmament verification and compliance monitoring that incorporate either into particular technologies directly in spacecraft or that require shared verification and safeguard technologies. Simply relying on independent "national means" of verification and compliance monitoring may not be sufficient due to technological impediments and/or monopolization of relevant monitoring technologies.[575]

(iii) Global Technology Development: Certain outer space endeavours will require levels of technological expertise and industrial capacity beyond the means of any one country. [576] In such cases the collective technological resource potential of the global community will need to be tapped. The needs for global technology development will range from facilitating global security applications to combating specific space-based threats to international security.

VI. Limitations of the Current International Technology Trade and Control Framework

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peaceful utilization of outer space. These guidelines are political, not legal, and therefore carry no binding force of international law. *See IADC Space Debris Mitigation Guidelines* (IADC-02-01, Revision 1, September 2007) available online at IADC Website: < http://www.iadc-online.org/index.cgi?item=docs_pub>.

[574] Consider the work of the International Association for the Advancement of Space Safety (IAASS) (a non-profit organization "dedicated to furthering international cooperation and scientific advancement in the field space safety systems"). *See* IAASS website at: <http://www.iaass.org/About.aspx>.The IAASS is in favor of conformity and harmonization of technology standards amongst space-faring States engaged in human space exploration in order to support essential astronaut systems, such as life support, emergency systems, and collision avoidance. *See* Gary Musgrave, Axel Larson, & Tommaso Sgobba, *Safety Design for Space Systems* (Oxford: Elsevier, 2009).

[575] *See* Paula A. DeSutter (U.S. Assistant Secretary for Verification, Compliance, and Implimentation), *Is an Outer Space Treaty Verifiable?* (Remarks to the George C. Marshall Institute Roundtable at the National Press Club, Washington, D.C.: 4 March 2008), available online at < http://www.nti.org/e_research/official_docs/dos/dos030408.pdf>. *See* A. Lukaszczyk, Laurance Nardon, Ray Williams, *Towards Greater Security in Outer Space: Some Recommendations* (Secure World Foundation/Note de I'lfiri: November 2009) at 23, available online at: < http://www.secureworldfoundation.org/siteadmin/images/files/file_380.pdf>.

[576] For example, identifying, tracking, and remedying NEO collision threats require a global response. *See* Jessica Tok, ed., *Asteroid Threats: A Call for Global Response* (ASE Report: 2008), available online at <http://www.space-explorers.org/committees/NEO/docs/ATACGR.pdf>.

As discussed *supra*, the current international framework governing space technology trade and controls is rooted in national control regimes and is designed first and foremost to protect the national security interests of individual States. The need for global technology sharing, exchange, co-development, transfer, and operation is not explicitly incorporated into the international framework. Notably absent is an international organization to facilitate outer space collective actions for either the maintenance of international peace and security, or more generally, for the peaceful development and use of outer space for all of mankind. Space technologies remain within the purview of national political and legal systems. In short, the current international framework is not designed to facilitate global space operations, nor the global development and use of technology. It is a framework rooted in the traditional model of space activity as a national activity.

For the time being, this means that technological facilitation of international collective actions to combat emergent outer space threats to international peace and security, and to enhance global security, will require ad-hoc case-by-case political and legal arrangements. States will enter in bilateral and multilateral agreements and/or arrangements as they deem necessary. But this approach carries with it several problems.

- Ad-hoc threat assessment may result in a response delay (a delay that could significantly increase the threat)
- Ad-hoc agreements and/or arrangements in which members of the international community can opt in or out without political and/or legal ramifications carry particular collective action problems.[577] Because combating space-based threats to international peace and security, as well as the enhancement of global security, is a non-frivolous public good, States with the capability to contribute have an incentive to either "free-ride" or delay in participating in a response.

[577] *See* Mancur Olson, *The Logic of Collective Action* (Harvard: Harvard University Press, 1971).

- Ad-hoc agreements and/or arrangements will exclude the global community from participation. This may result in several negative outcomes including:
    - (1) Political backlash from non-participating States[578]
    - (2) Economic costs that will not be distributed globally, burdening only those States who undertake action
    - (3) Technology that will not be pooled globally, potentially resulting in unnecessary duplication and/or a reduction in its development
    - (4) Non-participation of the global community may hinder the implementation of terrestrial elements to space-based operations (e.g. TT&C)
    - (5) Non-participating States may not have access to necessary technologies
- National space agencies must first and foremost satisfy their domestic political constituents. It is very likely that the interests of the global community will be secondary to the respective national interests of participating States absent an international organization to coordinate collective action.

D. Cooperation and Mutual Understanding

In addition to maintaining international peace and security, there are also legal justifications for reforming the current international framework in order to promote international cooperation and mutual understanding. In international law there is a general obligation to promote cooperation and mutual understanding. As proclaimed in the *Declaration of Principles of International Law Concerning Friendly Relations and Cooperation Among States,* "States have the duty to co-operate with one another,

[578] For emergent threats that rise to the level of global concern, it is quite possible that the international community, as represented in the G.A. of the United Nations, will pass a resolution calling for States to work collectively in a global fashion, thereby supplanting ad-hoc agreements/arrangements.

irrespective of the differences in their political, economic and social systems, in the various spheres of international relations, in order to maintain international peace and security and to promote international economic stability and progress, the general welfare of nations and international co-operation free from discrimination based on such differences."[579] This duty is reiterated in Article III of the Outer Space Treaty, obligating States to carry on activities in the exploration and use of outer space, in the interest of promoting international cooperation and mutual understanding.[580] The term "international cooperation" is also found in Article 1(3),[581] Article X,[582] and Article XI[583] of the *Outer Space Treaty.*

This general obligation is broad in scope and serves primarily as a principle to guide State actions.[584] Unlike the obligation to maintain international peace and security, promoting international cooperation and mutual understanding are not attached to enforceable norms such as Article 2, Article 24 and Article 25 of the *UN Charter.* As a result, this general obligation has been criticized as simply reflecting the good intentions of States, but in no way firmly committing them to specific actions.[585] Nonetheless, the

[579] G.A. Res 2625 (XXV), *Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations* (24 October 1970).

[580] Article III, *Outer Space Treaty.*

[581] Article I, para.3, *Outer Space Treaty*: "There shall be freedom of scientific investigation in outer space, including the moon and other celestial bodies, and States shall facilitate and encourage international co-operation in such investigation."

[582] Article X, *Outer Space Treaty*: "In order to promote international co-operation in the exploration and use of outer space, including the Moon and other celestial bodies, in conformity with the purposes of this Treaty, the States Parties to the Treaty shall consider on a basis of equality any requests by other States Parties to the Treaty to be afforded an opportunity to observe the flight of space objects launched by those States."

[583] Article XI, *Outer Space Treaty*: "In order to promote international co-operation in the peaceful exploration and use of outer space, States Parties to the Treaty conducting activities in outer space, including the Moon and other celestial bodies, agree to inform the Secretary-General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and practicable, of the nature, conduct, locations and results of such activities."

[584] *See* Aldo Cocca, "The Advances In International Law through the Law of Outer Space" 9 Space Law 13 (1981) at 18; "international cooperation is a legal obligation arising from the Outer Space Treaty, an obligation conditioning the lawfulness of space activities."

[585] *See* Henri A. Wassenbergh, "The International Regulation of an Equitable Utilization of Natural Outer Space Resources" in *Proceedings of the Thirty-Ninth Colloquium on the Law of Outer* Space at 138 (AIAA: New York, 1996). ("Principles [governing the Global Commons] are formulated in such a way that

engagement of States in greater international cooperative outer space activities is supported under the rubric of this general obligation to promote international cooperation and mutual understanding.

E. For the Benefit and Interests of all Countries – and Hence Mankind

In the previous sections, arguments in favour of global cooperation have been based in terms of both practical necessity and legal obligation. The strongest legal argument for global cooperation rests in the established international legal principle of maintaining international peace and security. A secondary argument is that the general principle of promoting cooperation and understanding supports greater civil space cooperation.

In this section, a more novel legal argument arises. First, it is proposed that the legal obligation for States to engage in the exploration and use of outer space for the "for the benefit and interests of all countries" carries with it a duty to act for the benefit and interests of mankind. Second, it is proffered that in certain circumstances the general duty for States to explore and use outer space for the "benefit of all countries" is elevated to a specific duty to engage global participation on civil space endeavours.

I. Outer Space as the Common Interest of Mankind

As early as 1956, the concept of outer space as a province of mankind had entered academic legal discourse.[586] In 1958, the United Nations General Assembly recognized "the common interest of mankind in outer space"[587] and expanded on this idea one year-later, recognizing "the common interest of mankind as a whole in the peaceful use of outer space" and expressed the belief that "exploration and use of outer space should only

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they remain completely non-committal, open-ended and merely reflecting the good intentions of the States.").

[586] *See* Andrew Haley, "Basic Concepts of Space Law" 26 Jet Propulsion 951 (1956).

[587] GA Res 1348 (XIII), *Question of the Peaceful use of Outer Space* (13 December 1958).

be used for the betterment of mankind."[588] In 1961, the General Assembly, in Resolution 1721, articulated two principles that were later incorporated into the Outer Space Treaty: "International law, including the Charter of the United Nations, applies to outer space and celestial bodies" and "outer space and celestial bodies are free for exploration and use by all States in conformity with international law and are not subject to national appropriation."[589] The resolution also recognized the common interest of mankind in the peaceful uses of outer space and stated their belief that space exploration should only be used for the betterment of mankind.

The Outer Space Treaty states:

1) Outer space is "the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes;" (preamble)
2) "the exploration and use of outer space should be carried on for the benefit of all peoples;" (preamble)
3) That outer space, including the moon and celestial bodies, "shall be the province of mankind;" (Article 1) and,
4) Astronauts are to be regarded as "envoys of mankind." (Article V)[590]

The vast majority of commentary on the Outer Space Treaty that assess the concept of mankind focuses on the operative nature of the relevant treaty provisions as they relate to and among States – overlooking the possibility that mankind is a distinct holder of international legal rights. This 'State-centric' perspective on the Outer Space Treaty and associate General Assembly Resolutions is not without merit as the Outer Space Treaty is an instrument of international law that binds States party to the treaty.[591]

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[588] GA Res 1472 (XIV), *International Cooperation in Outer Space* (12 December 1959).

[589] GA Res 1721 (XVI), *International Cooperation in the Peaceful Uses of Outer Space* (20 December 1961).

[590] *Outer Space Treaty.*

[591] In this State-centric context the mankind provisions are subject to several different interpretations. *See* G. Robinson and H. White Jr., *Envoys of Mankind – A Declaration of First Principles for the Governance of Space Societies* (Smithsonian Institute: Washington, D.C., 1986). *See* R. Dekanozov, "Judicial Nature of Outer Space, including the Moon and other celestial bodies" *Proceedings of the 17th IISL Colloquium on*

II. Mankind as an International Legal Development under *Corpus Juris Spatialis*

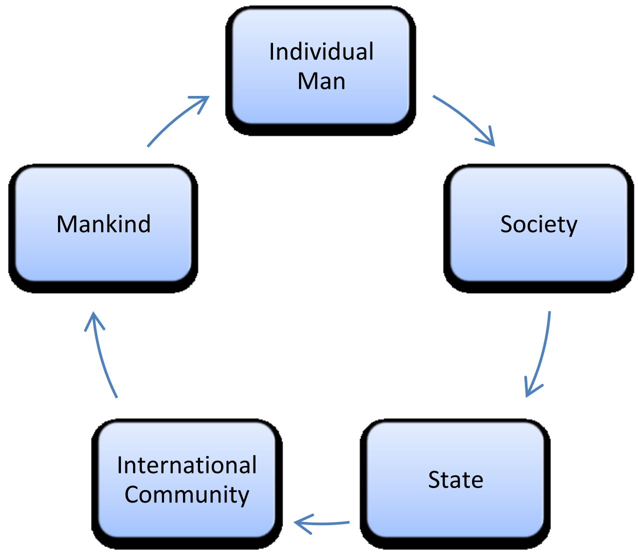
However, it is possible to take an alternative approach that supports the proposition that a legal obligation exists for States to engage in international civil space cooperation *for the recipient benefit of mankind.* This alternative approach conceives of "mankind" as a new international legal development that is the legal beneficiary of rights granted under international space law. The three most noted proponents of this idea are the eminent space law scholars Dr. Aldo Cocca, Dr. Stephen Gorove, and Dr. Ernst Fasan.

Dr. Cocca conceived of a *de lege lata jus humanitais,* a law of and for mankind, in which it is not international law that governs international relations, nor is it the international community – but instead it is the human race as a whole.[592] Cocca theorized "law" exists within a cyclical continuum of legal subjects. He expressed these subjects as:

Cocca's *Jus Humanitais* Continuum

the Law of Outer Space (AIAA: New York, 1974). *See* A. Bueckling, "The Strategy of Semantics and the Mankind Provisions of the Space Treaty" 7 *J. Space L.* 15 (1979). *See* J. Gabrynowicz, "The province and heritage of mankind reconsidered: A new beginning"
NASA Johnson Space Center, *The Second Conference on Lunar Bases and Space Activities of the 21st Century*, Volume 2 p 691-695 (1992).

[592] Aldo Cocca, "The Advances of International Law through the Law of Outer Space" 9 J. Space L. 13 (1981).



Cocca conceived of space law as fundamentally a humanistic proposition in which welfare of man is the beginning and the end of all human activity.[593] This proposition adopts mankind as is the *reason d'etre* and the primary beneficiary of international space law. Following this line of reasoning, Cocca concluded that "the international community from now on has recognized the existence of a new subject of international law namely Mankind itself, and has created a *jus commune humanitatis.*"[594]

Dr. Gorove agreed with Dr. Cocca's reasoning, supporting the idea of "mankind" as an emerging new international legal subject. Dr. Gorove proposed that:

> *Mankind as a concept should be distinguished from man in general. The former refers to the collective of people, whereas the latter stands for the individuals making up that body. Therefore, the rights of mankind should be distinguished, for instance, from the so-called human rights. Human rights are rights which individuals are entitled to on the basis of their belonging to the human race, whereas the rights of mankind relate to the collective entity and would not be analogous with the rights of individuals making up that*

[593] Aldo Cocca, "The Advances of International Law through the Law of Outer Space" 9 J. Space L. 13 (1981).

[594] *See* A. Cocca, "The Common Heritage of Mankind Doctrine and Principle of Space Law" *Proceedings of the 29th IISL Colloquium on the Law of Outer Space* (AIAA: New York, 1986).

entity…In fact, perhaps the time has come for the law to move in the direction of recognizing mankind's interests, its rights and obligations, as distinct from those of the nation State and provide for a fully representative body with appropriate international authority to act on its behalf.[595]

However, Dr. Gorove cautioned that mankind as an international legal personality is still *de lege ferenda.* He raises particular concerns regarding the ability of mankind to be "represented" on the international forum. Dr. Gorove theorized that the appropriate crystallization of mankind as an international legal personality would occur upon the establishment of an international organization with the legitimacy and authority to represent mankind and act on its behalf. But he also recognized that "no matter how logically attractive such a solution may sound, it is highly unlikely that, under present world conditions [1972 Cold-War], an authority could be setup."[596]

Dr. Fasan also proposed that "mankind" has special legal status under international law and that mankind has acquired "rights" from international space law.[597] Dr. Fasan reasoned these "rights" are granted to mankind as "the beneficiaries of space exploration and use."[598] With regards to the reservations expressed by Dr. Gorove, Dr. Fasan posits that subjects of international law need not be States, but simply persons (legal or physical) who are themselves acquiring rights and/or obligations of international law.[599]

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[595] Stephen Gorove, "The Concept of 'Common Heritage of Mankind': A political, moral, or legal innovation?" 9 San Diego L. Rev. 389 (1972) at 393 & 402.

[596] Stephen Gorove, "The Concept of 'Common Heritage of Mankind': A political, moral, or legal innovation?" 9 San Diego L. Rev. 389 (1972) at 394.

[597] Ernst Fasan, "The Meaning of the Term 'Mankind' in Space Legal Language" 2 J. Space L. 125 (1974).

[598] Ernst Fasan, "The Meaning of the Term 'Mankind' in Space Legal Language" 2 J. Space L. 125 (1974) at 131.

[599] Ernst Fasan, "The Meaning of the Term 'Mankind' in Space Legal Language" 2 J. Space L. 125 (1974) at 131. *See also Reparation for Injuries Suffered in the Service of the United Nations* (International Court of Justice, *Advisory Opinion,* 14 April 1949) at 8. The Court states: "The subjects of law in any legal system are not necessarily identical in their nature or in the extent of their rights, and their nature depends upon the needs of the community. Throughout its history, the development of international law has been influenced by the requirements of international life, and the progressive increase in the collective activities

Underlying this reasoning is a distinction between subjects of international law with legal representative capacity and those without. Fasan's position is that subjects of international law can include those legal or physical persons to whom international law grants substantive rights and/or obligations even when such subjects of international law do not necessarily have the capacity of a legal personality to represent themselves on the international plane.

Fasan deduces that because "mankind" is a legal beneficiary of rights established under international space law, the legal notion of "mankind" must have special international legal meaning. He concludes that mankind is undergoing the "process of becoming a new legal subject of international law."[600] Nonetheless, Dr. Fasan does not go so far as to conclude that mankind is definitively established as a distinct international legal personality. This reservation implicitly holds because mankind has not yet achieved the legal right to procedurally represent itself internationally.

III. Substantive Legal Rights of Mankind

Temporally setting aside the issue of international legal representation for mankind, let us return to the inquiry as to whether States hold positive legal obligations to mankind as *subjects* of international space law *regardless of the inability of mankind to exercise such legal rights on the international plane.*

To begin with, one must determine as to whether or not they accept "mankind" as a distinct recipient subject of legal rights under international space law. If one rejects mankind as a recipient subject, then mankind holds no rights. As a result, no other subjects of international space law – including States – will have a legal obligation towards mankind.

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of States has already given rise to instances of action upon the international plane by certain entities which are not States."

[600] Ernst Fasan, "The Meaning of the Term 'Mankind' in Space Legal Language" 2 J. Space L. 125 (1974) at 131.

There are two main schools of thought on this idea. The first rejects the premise that mankind is a distinct recipient subject of legal rights under international space law, rejecting claims of mankind as a passive subject of international law.[601] For them, mankind remains a philosophical, not a legal concept.[602]

The second accepts the mankind as a recipient subject of international space law, but does not accept mankind as having representation as an international legal personality. Fundamental to their position is the argument that "space law makes references to mankind as a whole granting certain rights to it and obliging states to a special behaviour towards it."[603] In this vein, ICJ Justice A. A. Concado Trindade wrote:

> *The understanding [has] been formed that the scientific-technological advances ought necessarily to revert to the benefit of humankind as a whole. In this line of thinking, the crystallization is nowadays undeniable…of the extension of the benefits of space exploration to the whole of mankind.*[604]

But this legal position immediately raises the question of (1) what particular rights are granted to mankind in the *Outer Space Treaty* and (2) how are these rights to be exercised if humanity does not have representative capacity?

IV. For the Benefit and Interest of all Countries and hence Mankind

One resolution to this dilemma is for an interpretation of Article I of the *Outer Space Treaty* in which the obligation of States to explore and use outer space "for the benefit and interest of all countries" encompasses the international legal subject of

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[601] *See* R.V. Dekanozov, "The CHM in the 1979 Agreement Governing the Activities of the States on the Moon and Other Celestial Bodies" *Proceedings of the 24th IISL Colloquium on the Law of Outer Space* (AIAA: New York, 1981).

[602] *See* K. Tatsuzawa, "Political and Legal Meaning of the CHM" *Proceedings of the 29th IISL Colloquium on the Law of Outer Space* (AIAA: New York, 1986).

[603] Gyula Gal, "Some Remarks to General Clauses of Treaty Space Law" 1(1) Miskolc Journal of Int. Law 1 (2004).

[604] A.A. Cancado Trindade, *International Law for Humankind: Towards a New Jus Gentium* – Hague Academy of International Law General Course on Public International Law (Martinus Nijhoff: Leiden, 2006) at 368.

mankind. In this reading of Article I, the centrality as the State as an international legal personality is maintained, keeping States as both the holder of the international legal right and the obligee of the right. But the universality of the right, its application to "all countries," even to those States *not a Party to the Agreement*, as well the collective nature of the right as an obligation to the benefit and interest of *all countries* as a group and not individual States, implies a solution to the inability of humanity to be represented. This solution is for humanity to be considered as subsumed into the legal concept of *all countries*. The collective interests of *all countries* therefore become representative of *all mankind*. The legal interest of mankind – in particular its interest in outer space being explored and used for the benefit for *all people* – is thus sustained.

It is admitted that significant criticism can be lodged against such a reading of Article I. This is a novel idea and this author has not read any scholarship proposing such a legal solution. Nonetheless, this proposal has been given in the interest of exploring legal theory and in providing the scholarly community with a new approach for recognizing mankind as a holder of legal interests in international space law. In the future, this legal approach toward Article I may prove fruitful.

V. Current Issues that Require Global Cooperation in Civil Space Endeavors

Regardless of whether one accepts the proposition that "mankind" is granted agency under the global collective of "all countries" as articulated in Article I(1) of the Outer Space Treaty, States are still obliged by the terms of Article I to explore and use outer space for the *benefit of all countries*.

It is proffered that in certain circumstances (exampled *infra*) this general duty for States to explore and use outer space for the "benefit of all countries" is elevated to a specific duty to engage global participation on civil space endeavours. This is because in these particular circumstances a lack of global engagement fundamentally threatens the general legal principle of Article I(1) to such an extent as to make ineffective the provision. The commonality amongst such circumstances is that absent global engagement, a precedent is established for the benefit of space activity to be allocated unilaterally by those States engaged without regard to the interests of all countries or mankind.

Consider the following:

i. **Exploitation of Resources on Celestial Bodies**: Major space-faring nations are now planning on returning to the Moon, exploring asteroids and other celestial bodies, and eventually establishing a manned presence on Mars. One of the explicit goals of these plans is to determine to what extent the natural resources of these celestial bodies can be exploited. It is a natural premise of humanity to explore and exploit the natural environment and outer space will be no exception.

Left unresolved in the *corpus juris* of international space law is the legality of resource exploitation on celestial bodies and whether this exploitation must substantively recognize and fulfill an obligation for the benefit of mankind. The Moon Agreement is an attempt by the international community to establish a legal agreement that provides for exploitation of natural resources on the Moon and other celestial bodies while also taking into consideration outer space as the "common heritage of mankind."[605] It sets out to establish an international regime to govern exploitation once "exploitation is about to become feasible."[606] The main purposes of this regime will be:

(a) The orderly and safe development of the natural resources of the Moon;
(b) The rational management of those resources;
(c) The expansion of opportunities in the use of those resources;
(d) An equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing

[605] *See* Article 11(1), *Agreement Governing the Activities of States on the Moon and Other Celestial Bodies* ("Moon Treaty"), signed 18 December, 1979, entered into force 11 July 1984, 1363 UNTS 3.

[606] Article 11(5), *Moon Treaty*.

countries, as well as the efforts of those countries which have contributed.[607]

The international community has not embraced the Moon Agreement. Only thirteen States are ratified parties, none of which are major space-faring States.[608] This lack of ratification by the international community means that a lacuna exists within international space law. If left unresolved, it will be State practice that will determine the evolution of the legality of celestial resource exploitation – potentially in a way that grants individual States preferential or exclusionary access and benefit to resources. In such a case, no longer would the celestial bodies be for the benefit "of all countries", but instead they would be only for those select States with the technology to engage in resource exploitation or political acumen to collaborate with such a State.

ii. **Manned Exploration and Habitation of the Moon and Mars:** In legal principle, astronauts – those humans who venture beyond the Earth – are considered envoys of mankind.[609] One reason for this status is that upon landing on Earth, astronauts are to be afforded unique protections. But a second consideration is that in the exploration and habitation of outer space it is in the interests of *mankind* for there not to be claims of sovereignty or appropriation by any individual State. By carrying the status as envoys of mankind, astronauts should be considered as unable to exercise indicia of sovereign claims of territory because their first and higher status as individuals is as representatives of mankind. Consider that when Neil Armstrong took his first step on the moon, it was "one small step for man, one giant leap for *mankind*."

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607 Article 11(7), *Moon Treaty*.

608 *See* UN Office for Outer Space Affairs website for up-to-date information, <http://www.oosa.unvienna.org/oosatdb/showTreatySignatures.do>. Several states are signatories but have not ratified the Treaty. *See also*, U.N. Document ST/SPACE/11/Rev.2/Add.3 *Status of International Agreements relating to Activities in Outer Space as of 1 January 2010*.

609 *See* Article 5, *Outer Space Treaty*. *See also*, *Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Outer Space Objects Launched into Space,* entered into force 3 December 1968, 672 UNTS 119.

However, this status of envoys of mankind will potentially erode once States engage in long-term habitation of the Moon, Mars, or other celestial bodies – especially if States continue the historical practice of unilateral manned exploration of celestial bodies. What will the future look like if it is Chinese or American 'astronauts' living on Mars, as opposed to astronauts of the United Nations or a global space organization? This may seem trivial, but the flags carried on the spacecraft and arms of the astronauts are extremely important symbolism. If one looks at the future as a series of linear events, each impacting the next to come, then establishing manned presence on celestial bodies under the rubric of individual States creates a potentially damaging precedent, undermining the legal status of outer space *as the province of all mankind* .

iii. **Space Based Solar Power:** As the energy needs of humanity place greater pressure on our non-renewable natural resources, space-based solar power is being considered as a 24-hour renewable resource.[610] If one accepts the proposition that humanity as an entity that consumes energy has a preference to seek more energy resources, then outer space is a logical progression in mankind's search for energy. Placed in orbits granting twenty-four hour sunlight, space-based solar power has the potential to serve as a major energy source.

I will not conjecture as to when humanity will undertake this step, but I raise the issue because such a project, if not undertaken for the benefit of all countries, could prove to be a point of contention in terrestrial politics – in particular, peace and security. If history is a teacher, then one needs only to reflect on the many wars that have been waged over access to energy resources. The international community may prevent such conflict *if* space-based solar power is undertaken for the benefit of all countries and not just for a few privileged States.

[610] *See* Molly Macauley & J. Shih, "Satellite Solar Power: Renewed Interests in the Era of Climate Change?" 23(2) Space Policy 108 (2007). *See also*, R. Bryan, J. Grey, & N. Kaya, "International Coordination of Space Solar Power Related Activities" 16(2) Space Policy 123 (2005).

VI. Parallel Developments of the Interests of Mankind under International Law

It is important to note the development of the interests of mankind in international law is not isolated to *corpus juris spatialis*.[611] In contemporary international law the interests of mankind are emerging in areas such as international humanitarian law, international human rights law,[612] and international environmental law.[613] The superior interests of mankind have also begun to receive recognition in the establishment of laws *jus cogens* and obligations *erga omnes* that supersede the interests of the State.[614] Whether these parallel developments represent a broader evolution of public international law towards recognition of mankind as a distinct international legal personality is a question posed at the end of this thesis for future research (See *Epilogue: Future Areas of Research*).

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[611] *See* A.A. Cancado Trindade, *International Law for Humankind: Towards a New Jus Gentium* (Martinus Nijhoff: Leiden, 2010) at 275. "It is not suggested here that, at the present stage of evolution of International Law, humankind is replacing States as a subject of international law. What is here asserted is that State are no longer the sole subjects of International Law, with international organizations and individuals and groups of individuals; and, moreover, humankind as such had also emerged as a subject of International Law."

[612] The emergent of universal legal rights associated for all persons has a strong correlation to a broader conception of certain rights residing in humanity as a whole. *See Universal Declaration of Human Rights,* A/Res/3/217 (10 December 1948). *See also* A.A. Cancado Trindade, *International Law for Humankind: Towards a New Jus Gentium* (Martinus Nijhoff: Leiden, 2010) at 286. "Recourse to the very notion of humankind as subject of International Law promptly brings into the fore, or places the whole discussion within, the human rights framework…."

[613] The concept of intergeneration justice and common patrimony within international environmental law has considerable recognition of mankind, including future generations of mankind, as distinct holders of international legal rights. *See* Janna Thompson, *Intergenerational Justice: Rights and Responsibilities in an International Global Polity* (Routledge: New York, 2009). *See also* E. Brown Weiss, *In Fairness to Future Generations: International Law, Common Patrimony and Intergenerational Equity* (Transnational Publishers: Dobbs Ferry, NY, 1989). *See also* D. Clayton Hubin, "Justice and Future Generations" 6(1) *Philosophy and Public Affairs* 70 (1976).

[614] *See Barcelona Traction, Light and Power Co. Ltd*. (Belg. v. Spain), 1970 I.C.J. 3, 32 (Feb. 5). "Such obligations derive, for example, in contemporary international law, from the outlawing of acts of aggression, and of genocide, as also from the principles and rules concerning the basic rights of the human person, including protection from slavery and racial discrimination. Some of the corresponding rights of protection have entered into the body of general international law (*Reservations to the Convention and Punishment of the Crime of Genocide, Advisory Opinion, I.C.J. Reports 1951*, p. 23); others are conferred by international instruments of a universal or quasi-universal character." *See also* Cherif Bassiouni, "International Crimes: *Jus Cogens* and *Obligatio Erga Omnes"* 59 (4) Law and Contemporary Problems 63 (1997). "Certain crimes affect the interests of the world community as a whole because they threaten the peace and security of humankind and because they shock the conscience of humanity."

F. A World Space Organization

One resolution to the aforementioned lacunae of international law is for the international community to establish a global organization that services outer space, facilitating the legal and political advancement of international space law and policy. It should be noted that the author recognizes that an international organization is a traditional positive law approach to the resolution of international dilemmas, but that in modern international law novel alternative mechanisms of global governance now exist. Nonetheless, due to the State centric nature of space exploration and use, as well as the State centric paradigm of space technology trade and proliferation controls, it is believed that the traditional international organization model of State engagement still holds primary validity for the diverse areas of global concern encompassed by outer space.[615]

Towards that end, this section examines the idea of a world space organization as an international legal-political mechanism to facilitate greater international cooperation in outer space. First, international political support for a WSO is assessed. Second, the unique organizational attributes of centralization and independence are examined. Third, practical needs that could be serviced by a WSO are discussed. Thereafter, basic provisions for a WSO are proposed. Finally, a WSO complementary global space technology control initiative is proposed as an alternative to the current paradigm discussed in Chapter 7.

I. Political Support for a WSO

The idea for a more comprehensive international approach for human activity in outer space is harks back as early as the 1950s.[616] Scholars such as Simone Courtelx,

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[615] The author of this thesis forecasts that States will eventually establish an international organization specific to space-related matters. The evolution of State practice towards the establishment of a WSO may be preceded by other forms of agreement and/or arrangement, such as informal inter-agency consultation arrangements, standing committees within the current U.N. institutional structure, and other ad-hoc arrangements. Examination of these intermediary agreements/arrangements is beyond the scope of this thesis. However, as is noted at the end of this thesis, further research is needed in this area (*See Epilogue: Future Areas of Research*).

[616] *See* Phillip Jessup and Howard Taubenfeld, *Controls of Outer Space* (New York: Colombia University Press, 1959) at 275-280. In this book, Jessup and Taubenfeld explored the possibilities of international

Alexander V. Yakovenko, K.B. Serafimov, V. Vereschetin, E. Kamenestskaya, Kenneth Padnerson, Yun Zhao, Chukeat Noichum, and Stephen Doyle have all contributed to the scholarly discourse on this subject.[617] Historically, a WSO has had varying degrees of political support amongst space-faring States. The most pronounced political support for a world space organization arose in 1988, at which time the U.S.S.R. submitted to UNCOPUOS a draft charter for a world space organization and actively supported the proposal.[618]

Since 1988 there has been no significant political support amongst major space active States for the establishment of a WSO. After the U.S.S.R. collapsed, the UNCOPUOS proposal for a WSO was shelved. Since that time, neither the United States, nor Russia or other major space-faring States have resubmitted WSO proposals for consideration to UNCOPUOS. However, below the level of UNCOPUOS, political recognition of the necessity for global space cooperation is materializing.

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order in outer space beyond the "strictly functionalist approach." Jessup and Taubenfeld identify three forms that international control could be administrated in space: (1) a "quasi-international" approach that would include demilitarization and the establishment of a trusteeship,[616] (2) an international regime that is an intermediate between a trusteeship system and direct international administration, and (3) the establishment of an international organization "for the advancement of the welfare of all men through activities in outer space." While their first two proposals have fallen aside due to the legal-historical development of human activity in outer space, their third proposal, the idea to establish an international space organization, still generates interest and may have a legitimate and justified claim for the international community to consider.

[617] *See* Simon Courtelx, "Is it necessary to establish a world space organization?" *Proceedings of the 36th IISL Colloquium on the Law of Outer Space* (AIAA: New York, 1999). *See* Stephen Doyle, "International Space Plans and Politices: Future Roles of International Organizations" 18 J. Space L. 123 (1990). *See* V. Vereschetin & E. Kamenetskaya, "On the Way to a World Space Organization" 12 Annals of Air & Space Law 337 (1987). *See* Chukeat Noichim, "International Cooperation for Sustainable Space Development" 31 J. Space L. 315 (2005). *See* Kenneth Pederson, "Is it time to create a World Space Agency?" 9 Space Policy 89 (1993). *See* A.S. Piradov, "Creating a World Space Organization" 4 Space Policy 112 (1988). *See* K.B. Serafimov, "Achieving Worldwide cooperation in Outer Space" 5 Space Policy 111 (1989). *See* Yun Zhao, "An International Space Authority: A Governance Model for a Space Commercialization Regime" 30 J. Space L. 277 (2004).

[618] *International Co-Cooperation in the Peaceful Uses of Outer Space: Note by the Soviet Socialist Republics,* A/AC.105/407 (1988). *See also*, *Charter of a World Space Organization: U.S.S.R. Working Paper,* A./AC.105/L.171; Supplement No.20 (A/43/20) 43rd Session U.N.G.A. (1988).

Since 2006, the fourteen most significant space agencies[619] on Earth have been engaged in non-binding discussions on global civil space exploration cooperation.[620] In 2007, these GES discussions culminated in a Global Exploration Strategy Framework (GESF). The GESF recognizes that "Sustainable space exploration is a challenge that no one nation can do on its own." The GSEF elaborates as an action plan to for robotic and human space exploration, focusing on destinations within the solar system where humans may one day live and work. Implementation of this plan is recommended via a voluntary, non-binding forum, called the *International Coordination Mechanism*, through which Participating States can collaborate.

Importantly linked to the question of a WSO is the issue of outer space weaponization and arms control, an area of significant political activity for China and Russia. In 2008, China and Russia jointly submitted the draft *Treaty on Prevention of the Placement of Weapons in Outer Space and the Threat or Use of Force against Outer Space Objects* (PPWT). The draft treaty represents an important starting point for space-active States to engage negotiations. Advancement of international space law in this field will strongly complement a WSO initiative.

Another important development is the *2010 National Space Policy of the United States*. The new U.S. Space Policy represents a significant departure from traditional U.S. positions regarding outer arms control. Breaking from previous administrations, official U.S. space policy is now to consider concepts and proposals for outer space arms control measures.[621] This is a powerful signal that initiatives in the U.N. Disarmament Committee, such as the co-sponsored Chinese-Russian draft *Treaty on Prevention of the Placement of Weapons in Outer Space and the Threat or Use of Force against Outer*

[619] In alphabetical order: ASI (Italy), BNSC (United Kingdom), CNES (France), CNSA (China), CSA (Canada), CSIRO (Australia), DLR (Germany), ESA (European Space Agency), ISRO (India), JAXA (Japan), KARI (Republic of Korea), NASA (United States of America), NSAU (Ukraine), Roscosmos (Russia). "Space Agencies" refers to government organizations responsible for space activities.

[620] *Global Exploration Strategy: Framework for Coordination* (May 2007) at 5, available online at NASA website <http://www.nasa.gov/pdf/178109main_ges_framework.pdf>.

[621] *National Space Policy of the United States* (28 June 2010) at 7, available online at Whitehouse Website < http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf>.

Space Objects (PPWT),[622] now have political viability. U.S. space policy also manifests a commitment to international cooperation. The goals of U.S. policy includes: (1) Strengthen Interagency Partnerships, (2) Identify Areas for Potential International Cooperation, (3) and Develop Transparency and Confidence Building Measures.[623]

This current political atmosphere indicates that amongst major space-faring States, voluntary participation in international civil space coordinated missions is viable. In the near future, significant advancement may be achieved on the issue of outer space arms control. Yet notably absent from these discussions is the more grand vision of cooperative missions on a global scale. Neither legally binding global civil space cooperative agreements nor participation by the non space-faring global community are included in the current political discourse. The political *status quo* is for States to engage in civil space activities only with other 'agency' States, in particular strategic allies, and only if it is in the mutual benefit of the participating States. The use and exploration for the benefit and interests of all countries and of mankind is not a top political priority. As will be discussed *infra,* it is theorized that a reason for this political climate is a self-justified security dilemma that perpetuates political attitudes of non-enlightened unilateral self-interest.

However, even in light of the current political atmosphere of non-engagement for the idea of establishing a WSO, it is still with merit to examine the idea for the following reasons. First, political interests can change quickly, as evidenced by the proposals for a WSO submitted by the former USSR. Second, as has been discussed *supra*, there are a number of issues involving outer space whose resolution requires greater international cooperation, and in some instances global cooperation. Third, the facts-on-the-ground related to international concerns such as space debris, space weaponization, and *in situ* resource exploitation can change quickly and create the impetus for international political action. Fourth, as will be discussed *infra*, a WSO has unique attributes that cannot be

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[622] *Draft Treaty on Prevention of the Placement of Weapons in Outer Space and of the Threat or Use of Force against Outer Space Objects,* CD/1839 (29 February 2008).

[623] *National Space Policy of the United States* (28 June 2010).

achieved through other means of international cooperation, attributes that greatly facilitate the resolution of collective action problems in outer space and that will justify future political support.

II. Unique Organizational Attributes of a WSO

States create and participate in international organizations because international organizations can "achieve goals that [States] cannot accomplish on a decentralized basis."[624] Justification for State establishment and participation in an international organization, including a WSO, is therefore linked to the unique functional attributes that are deliverable by an international organization: *centralization* and *independence*.[625] These functional attributes give the WSO the ability to deliver economic, security, or political benefits either *more efficiently* than non-WSO methods or in a manner *unique* to the international organization model.[626]

i. Centralization

A WSO can serve as a centralized organization point for the global community. This attribute of *centralization* provides benefits for both direct State interaction and operational activities. For State interactions, a WSO can serve as a stable negotiating forum, depoliticize State interactions, embody the precise terms of State interaction, influence the evolution of inter-State cooperation as conditions change, standardize and regulate transnational activity, and provide support functions (e.g. conferences/working groups/etc.). For operational activities a WSO can serve as a manager, provide a pooling of assets and risks, and enable joint production or operations.[627] Space operations and the

[624] Kenneth Abbott & Duncan Snidal, "Why States Act Through Formal International Organizations" 42(3) Journal of Conflict Resolution 3 (1998) at 29.

[625] Kenneth Abbott & Duncan Snidal, "Why States Act Through Formal International Organizations" 42(3) Journal of Conflict Resolution 3 (1998) at 8.

[626] *See* W. Duncan, B. Janice-Webster, B. Switky, *World Politics in the 21st Century* (Houghton Mifflin: U.S.A., 2009) at 165-170.

[627] Kenneth Abbott & Duncan Snidal, "Why States Act Through Formal International Organizations" 42(3) Journal of Conflict Resolution 3 (1998) at 10-17.

production of space technologies/goods can be undertaken under the auspices of the WSO.

ii. Independence

A WSO should be independent from the political control of any particular Member State. A substantively independent WSO "can facilitate inter-State collaboration by pushing negotiations forward." In this way, the *independence* of the WSO enhances the efficiency and legitimacy of collective and individual State actions. Interestingly enough, an independent WSO can also support State initiated proposals that otherwise would have been unacceptable in their original State-to-State form, but that are granted legitimacy when 'laundered' through an international organization.[628] This laundering can be used to facilitate global space cooperation by providing political cover for domestic politicians that otherwise could not justify to domestic constituents cooperation with another State. The current U.S. policy of non-engagement with China on cooperative civil space missions is one example of a domestically unacceptable proposal that could be granted political legitimacy when undertaken through a WSO.

III. Practical Needs that Could be Serviced by a WSO

Since Sputnik was first launched in 1958, mankind has become a space-faring species, utilizing outer space applications for civil, commercial, and military activities. Together with manned and unmanned exploration of outer space, these applications have provided humanity with important tools to better understand ourselves and our environment and to contribute to a higher standard of terrestrial living. Outer space and its related applications are central to continued human social and economic development, security, wellbeing, and survival. As our understanding and utilization of outer space and our home planet have broadened, certain space-related issues have arisen that legitimately require greater international cooperation and coordination, either because of their

[628] Kenneth Abbott & Duncan Snidal, "Why States Act Through Formal International Organizations" 42(3) Journal of Conflict Resolution 3 (1998) at17-23.

transnational nature or because of their technical complexity, in the form of a centralized and independent international organization. The following are illustrative:

(i) Space Environmental Degradation (Aka. “Space Debris”): A world space organization could facilitate promulgation, standardization, harmonization, and enforcement of space debris and space environment degradation controls. Through the centralized and independent offices of an international space organization, the international community could effectively implement binding international standards, uses a variety of mechanisms, including audits, public shaming, technical working groups, development funding mechanisms.

(ii) Global Climate Change: Global climate change and other terrestrial environmental challenges require space-based observation and scientific investigation. A WSO can coordinate space-based environmental programs, operations, and assets through a centralized agency. Dissemination and sharing of data and information can be treated as a global public good under the offices of the WSO.

(iii) Near-Earth Object Threats: A WSO can serve as the lead-agency in charge of NEO surveillance, remediation, and emergency threat response. It can coordinate a global space-surveillance network, support scientific investigation of NEOs, develop NEO related space-technologies, plan and operate NEO missions, and provide a political forum for NEO related actions.

(iv) In-Orbit SSA/SSTM: Commercial and civil space actors have a growing interest in space situation awareness and space systems traffic management.[629]As evidenced by the recent Iridium 33-Kosmos 2251 collision,

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[629] *See* Richard Dal Bello, “Commercial Management of the Space Environment” (Paper Presented at the 2009 Interdisciplinary Space Debris Congress at McGill University: May 7th-May 9th , 2009); available online at: < http://www.mcgill.ca/files/iasl/Session_4_Richard_DalBello_Paper.pdf>. *See also* Tommaso Sgobba & Ram Jakhu eds., *ICAO for Space* (IAASS White Paper, 2008).

there is a definite need for a civil SSA/SSTM.[630] Today the only SSA systems in operation are owned and operated by States. As reflected by the limited public services provided by these SSA systems, the nature and purpose of the State operated systems are primarily military.[631] There is no global public SSA, nor is there a SSTM system. A WSO can service this need by providing a global public civilian SSA/SSTM system.

(v) Commercial and Civil Aerospace Vehicles: There is no international organization responsible for aerospace vehicles.[632] The safe and orderly operation of suborbital and orbital aerospace vehicles requires an international air and outer space traffic management system that covers all altitudes and orbits in which suborbital and orbital vehicles traverse.[633] A WSO can act as the international organization that provides for the safe and orderly development of commercial and civil aerospace transportation, establishing international standards for navigation, communication, and safety and integrating aerospace vehicles into a global aviation and outer space traffic management infrastructure.

(vi) Space Exploration: For both manned and unmanned space exploration, a WSO can provide the political benefits of global cooperation and

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[630] *See* William Broad, "Debris Spews into Space After Satellites Collide" *New York Times* (11 February 2009) at A28. *See also*, *Report of the 2009-2010 Montreal-Cologne International Interdisciplinary Congress on Space Debris* [Unpublished but currently being edited by McGill University Institute of Air & Space Law for publication in 2011].

[631] *See* Lt. General Larry D. James, *Statement of Commander Joint Functional Component for Space and 14th Air Force* (U.S. Senate Subcommittee on Strategic Forces: 10 March 2010).

[632] Paul Dempsey & Michael Mineiro, "ICAO's Legal Authority to Regulate Suborbital Flight" in Ram Jakhu & Joseph Pelton, eds. *Space Safety Regulations and Standards* (London: Elsevier, 2010). Paul Dempsey & Michael Mineiro, "Suborbital Aerospace Transportation and Space Traffic Management: A Vacuum in need of Law" *Presented at the 59th IAC, Technical Session E3.2 on Space Policies and Programs of International Organizations* (Glasgow, 2008).

[633] Paul Dempsey & Michael Mineiro, "ICAO's Legal Authority to Regulate Suborbital Flight" in Ram Jakhu & Joseph Pelton, eds. *Space Safety Regulations and Standards* (London: Elsevier, 2010). Paul Dempsey & Michael Mineiro, "Suborbital Aerospace Transportation and Space Traffic Management: A Vacuum in need of Law" *Presented at the 59th IAC, Technical Session E3.2 on Space Policies and Programs of International Organizations* (Glasgow, 2008).

coordination. Through centralized mission planning and shared mission operations, a WSO can provide the economic benefits of cost-sharing, pooled resources, and a reduction of duplicated effort. Most importantly, a WSO will provide a platform from which the entire global community can participate in the peaceful exploration and use of outer space. This global participation will strengthen the international culture of cooperation, creating a shareholder's mentality for all States, while reinforcing the principles of international space law.

(vii) Outer Space Arms Control, Disarmament and Proliferation: A WSO can serve as the lead agency for ensuring verification and compliance with outer space arms control, disarmament, and proliferation agreements. A WSO could own and operate space-based assets for verification and compliance and engage personnel for terrestrial and space-based on-site inspections. As an added benefit, a WSO could provide independent space-based means of compliance verification for terrestrial arms control, disarmament and proliferation regimes, as well as responding to requests from the U.N. Security Council for satellite verification of Security Council Resolution compliance.[634]

(viii) In-Situ Resource Exploitation: A WSO can help ameliorate the current lacuna in international space law on the question of the legality of in-situ resource exploitation. If the *Moon Treaty* international regime is implemented, the WSO can serve as its organizational home. If alternative approaches to

[634] Consider the remarks made by Secretary of State Colin L. Powell on February 5, 2003 to the U.N. Security Council regarding claims of Iraqi non-compliance with UNSC Resolutions. In these remarks, Secretary Powell presented U.S. satellite imagery. This satellite imagery was captured by, processed by, and interpreted by the United States. After the U.S. led forces invaded Iraq, it came to light that the satellite images and their interpretation by Secretary Powell were not accurate – there was no evidence of WMD in Iraq. An independent UN entity that provides satellite verification and compliance monitoring of UNSC resolutions and international arms control/disarmament agreements can avoid future reliance on national means of verification that may be subjectively presented for unilateral interests.

resource exploitation are adopted, the WSO can still provide organizational services.

(ix) Enhancement of Global Civil Security: A WSO can engage in space endeavours with terrestrial applications that enhance global civil security. A WSO can coordinate amongst all Member States, implementing and disseminating the benefits of global security enhancement programs worldwide. The range of programs the WSO can undertake is broad, including natural resource management and environmental monitoring, communication and information applications, meteorology, risk reduction and disaster management.

IV. Representative of Mankind's Interest in Outer Space

The establishment of the WSO can also facilitate the advancement of international law for mankind. Within the WSO organizational structure, a WSO Representative of Mankind can be established that serves as the legal representative of mankind's interest in outer space. The exact nature of this Representative Body is open to debate and could take a variety of forms. For example, there could be elected and/or appointed persons grated unique legal status under international law that grants them diplomatic protection, requires they maintain the utmost objectivity and minimize conflicts of interests with their States of nationality. These persons would serve to represent mankind's interest in outer space, in accordance with the authorities granted to them under the WSO Charter. In this faculty, the Representative Body would interact with the other primary bodies of the WSO, as well as the UN Organization, providing legal and physical personality to mankind.

V. WSO Basic Provisions

The WSO should be established as an umbrella organization from which the global community can engage particular space-related issues. As an organization not linked to any particular problem, but instead to purposes and principles, this organization can respond organically over-time as new challenges arise in outer space. As a UN special agency, the WSO can incorporate and support UN purposes and principles while also tailoring its own specifically to outer space and international space law.

The following are proposed purposes, principles, and the primary bodies of a world space organization. They are meant to provide guidance. As is discussed in the *Epilogue: Future Areas of Research,* further research is needed to delve in-depth into the particularities of a WSO Charter.

Purposes:

1. *To maintain peace and security in outer space*
2. *To promote cooperation and mutual understanding in outer space*
3. *To achieve the exploration and use of outer space for the benefits of all countries*
4. *To represent the international legal interests of mankind in outer space*
5. *To facilitate the participation of the global community of States in the exploration and use of outer space*
6. *To assist the United Nations in the fulfillment of its purposes*
7. *To a be a center for harmonizing the actions of States in the attainment of these common ends*

Principles:

1. *Members shall act in accordance with the UN Charter*
2. *Members shall respect and act in accordance with the principles of the Outer Space Treaty*
3. *Members shall fulfill in good faith the obligations assumed by them in accordance with the WSO Charter*
4. *Members shall refrain from the threat or use of force in outer space or against any space-based assets, including spacecraft, space personnel, and facilities on celestial bodies*

5. *Members shall abstain from the development or deployment of space-based weapons in accordance with the WSO Charter and WSO Complementary Agreements**
6. *Members shall be transparent in their space activities, including space technology development and production programs, in accordance with the WSO Charter and WSO Complementary Agreements**
7. *Members shall submit to compulsory jurisdiction of the WSO dispute resolution mechanism*

Primary Bodies:

1. *WSO Assembly*
2. *WSO Council*
3. *WSO Secretariat*
4. *WSO Representative of Mankind*
5. *WSO Judicial Authority*

VI. WSO Complementary Agreements

Complementary agreements are binding legal treaties that are concluded in conjunction with the primary WSO Charter. In order for a WSO to succeed, the WSO Charter Agreement must be supported by complementary agreements on outer space disarmament and space technology trade and proliferation controls. The importance of these agreements is great enough to warrant their inclusion into the principles of the proposed WSO Charter. In the future, additional complementary agreements can be concluded as the WSO Membership deems them necessary.

G. The WSO Space Technology Trade and Proliferation Regime: A Global Cooperative Paradigm of Control

In Chapter 8, the current paradigm of space technology trade and proliferation controls was described as national centric. The key characteristic of the current paradigm is that controls originate at the national level, reflecting the prioritization of domestic political concerns. This conceptual paradigm is reflected in the absence of a legally binding supra-national space technology trade and proliferation control regime. This national conception of controls is complemented with an implicit strategic conception that States should maximize their legal discretion in exercising trade and proliferation controls.

An alternative to this paradigm is a global space technology trade and proliferation regime that is established in conjunction with the WSO and a complementary outer space disarmament agreement. In this global regime, States agree not to develop space technologies in violation of either the WSO outer space disarmament agreement or the WSO Charter. States grant the WSO supra-national authority to promulgate regulations on space technology trade and proliferation. The manufacturing, sale, purchase, and distribution of space technologies will be controlled via a WSO regulatory framework. Licenses will be issued by WSO Member States in accordance with WSO regulations. The WSO will be authorized to monitor Member State space technology development and production programs to ensure compliance.

The strategic logic of this global regime is that States benefit more from cooperation and transparency in their space activities than from unilateralism. Linking space technology controls to an outer space disarmament agreement further strengthens this logic. If outer space disarmament is achieved, States no longer have the strategic benefit of unilateral military space technology development and production. Transparency and monitoring of space technology development and production programs will ensure compliance with the disarmament agreement, while at the same time providing assurance to fellow WSO that all Member States are adhering to WSO trade and proliferation regulations.

In the event a WSO Member is accused of violating the rules, the WSO will initiate an independent judicial process to resolve accusations and, if necessary, to issue enforcement orders. Enforcement of WSO judicial rulings will occur first within the authority of the WSO Charter. In the event violators do not respond to WSO censure, the matter can be referred by the WSO to the United Nations Security Council for consideration as a breach of international peace and security. The UNSC will retain exclusive authority to enforce violations through the implementation of Security Resolutions authorizing measures, including the use of force.

H. A Self-Justified Security Dilemma and the Perpetuation of Unilateralism

A great hindrance to the development and implementation of a world space organization and a global paradigm of space technology trade and controls is a self-justified security dilemma that perpetuates unilateralism in outer space.

The dilemma can be summarized as follows:

> *Sovereign States, subject to certain legal limitations, can produce and procure space items and technologies, even if these items or technologies can be used as armaments, weapons, and other implements of war. While international law restrains States from exercising the use of force, in practice States sometimes use force in contravention to international law. So long as States have the military capability to effectively engage other States and so long as space goods and technologies can be indigenously produced and/or procured, absent an international regime to regulate trade and proliferation, national export controls will exist in order to alleviate security concerns of the exporting State and international cooperation in civil and commercial space endeavors will be hindered to the extent necessary to protect unilateral security interests.*

Under Article 2 of the United Nations Charter, "all Members shall refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any State, or in any other manner inconsistent with the Purposes of the United Nations."[635] This is considered a bedrock principle of the modern international State system. But Article 2 does not prohibit States from producing and/or

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[635] *United Nations Charter* Article 2(4).

procuring implements of military force, including space related goods and technologies. Sovereign States have the legal right to create and maintain a military force with the *capability* of violating the territorial integrity or political independence of other States, so long as the standing military force is not a threat to the territorial integrity or political independence of other State or to international peace and security. This includes space-based military assets.

In other words, the international legal system creates a community in which all States are granted legal Sovereign rights on the basis of equality, but that in practice States wield unequal power. The Sovereign power to maintain a standing military and to develop implements of war is shared equal amongst all States. But some States, due to their geography, resource allocation, or other factors, are able to sustain stronger military forces and its associated military technology base.

With regards to the aforementioned Security Dilemma, it is in the interests of a State to control the export of goods and technologies that the State believes may result in negative consequences for itself and/or its citizens. This is most evident in military (or "sensitive") space goods and technologies, but it is not necessarily limited to these goods. In some instances self-interest results in the control of "dual-use" or "civilian" space goods. Until the paradigm of self-interest is emasculated, export controls will exist, in one form or fashion, within the current national centric form.

If the aforementioned Security Dilemma can be resolved then export controls can evolve beyond the current paradigm. For the limited purposes of facilitating greater international civil space cooperation, it may not be necessary to completely resolve this Security Dilemma, but instead to mitigate the potential risk to States engaged in cooperative outer space ventures. This type of mitigation may take the form of arms control, disarmament and proliferation agreements.

A gradual evolution of international law via inter-State agreements best represents the political realities of the current inter-State structure of Sovereign States. The establishment of a world space organization would be an important step in this evolutionary process, as it would create an important foundation for States to advance international law in favor of greater global cooperation

I. An Oligarchic Future of State Relations, Export Control, and Space Technology Trade

This author forecasts that if the international community fails to engage more fully towards truly global civil space cooperation, complemented by advancement in international space technology trade and proliferation controls, then the result will be an evolution of international cooperation in civil and commercial space endeavours that is biased towards an oligarchic world order.

In the field of space technologies, if left unchecked this bias should manifest itself as the exclusion of less powerful States from the full benefits of cooperating on space activities, including space technology development. National export control policies of space-faring States will evolve to reflect a preference towards particular oligarch partners viewed as strategic. Absent an international regime, discrimination against particular States and the exclusion of non-space-faring States can be justified on the basis of national security, trade, and proliferation concerns. In such a scenario, international law and the rhetoric of sovereignty will become tools to sustain the space policies of the oligarchy. Amongst oligarch partners there will be free trade in launch services and liberal trade policies in space goods and technologies. Respectively, their space activities would become intertwined through joint commercial, civilian, and military ventures. This type of power structure raises the spectre of the oligarchy eroding the fundamental principles of international space law through de facto appropriation and exclusionary policies.[636]

J. Analogy to Kant's Cosmopolitan Condition

The aforementioned proposal for a world space organization, the identified self-justified Security Dilemma, and forecasts of an oligarchic order bear close resemblance

[636] *See* Article II, *Outer Space Treaty.*

to an evolution of international law and relations proposed by Kant – termed the "Cosmopolitan Condition."[637] Kant hypothesizes that the external relations among States are evolving towards a paradigm that he termed a "league of nations" in which "even the smallest State could expect security and justice not from its own power and by its own decrees," but from "a united power acting according to the decisions reached under the laws of their united will."[638] In Kant's thinking, this teleological evolution is often frustrated because States have the legal authority to exercise an "unrestricted freedom in relations to others." This freedom of authority creates the aforementioned self-justified Security Dilemma, a phenomena Kant terms the "guise of external well-being."[639]

Kant reasons there are two teleological propositions to the evolution of external relations amongst States. The first proposition, which Kant adopts, is that over time through "war, through taxing and never-ending accumulation of armament, through the want which any State, even in peacetime, must suffer internally… [through] devastations, revolution, and even complete exhaustion… [States are brought] to that which reason could have told them at the beginning," that the appropriate action is to sacrifice their sovereign authority to wage war in the interests of a league of nations.[640]

Fundamentally, this proposition is rooted in the logic and necessity of cooperation. When analogized to outer space, emerging threats to international peace and security, the need to facilitate international cooperation and understanding, and ultimately the future of humanity in outer space supports the proposition that appropriate State action is to relinquish unilateralism and engage in truly global civil space endeavors.

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[637] Immanuel Kant, "Idea for a Universal History from a Cosmopolitan Point of View" in Lewis W. Beck Ed., *Kant: On History* (New York: MacMillian Publishing Corp., 1989).

[638] Immanuel Kant, "Idea for a Universal History from a Cosmopolitan Point of View" in Lewis W. Beck Ed., *Kant: On History* (New York: MacMillian Publishing Corp., 1989) at 19.

[639] Immanuel Kant, "Idea for a Universal History from a Cosmopolitan Point of View" in Lewis W. Beck Ed., *Kant: On History* (New York: MacMillian Publishing Corp., 1989) at 21.

[640] Immanuel Kant, "Idea for a Universal History from a Cosmopolitan Point of View" in Lewis W. Beck Ed., *Kant: On History* (New York: MacMillian Publishing Corp., 1989) at 18-19.

The second proposition, which Kant declines to accept, is a teleological vision in which humanity fails to grasp the logic of cooperation. It is a vision that "everything should remain as it always was that we cannot therefore tell but that discord, natural to our race, may not prepare for us a hell of evils, however civilized we may now be, by annihilating civilization and all cultural progress through barbarous devastation."[641] In such a world, outer space would be but an extension of terrestrial conflict. Humanity would never achieve peaceful co-existence on Earth or in outer space. It is a future in which the failure of the international community to cooperate will result in a collective loss for mankind, perhaps even leading to the destruction of the human species.

To discover within Kant's philosophical text from the late 18th century the same self-justified Security Dilemma that exists for space technology export control raises the question of teleological purpose. Although time has yet to tell, it seems that Kant's prediction of an evolution amongst State external relations towards restrictions of sovereign authority to wage war is coming true. The League of Nations and its progeny, the United Nations, have adopted a prohibition on the threat or use of force against the territorial sovereign or political independence of a State. The European Union is coalescing into an economic community that is likely to one day to include military integration. The threat of weapons of mass destruction has tempered the political calculation of war amongst the most powerful States. Cautiously though, Kant predicts that the evolution of international law may include extreme violence, destruction, and war before its end is achieved. To a certain extent, Kant's prediction has come true, for it was World War I and World War II that ultimately perpetuated the impetus for the League of Nations and the United Nations.

Ultimately it is human choice that shall decide whether or not our legal-political evolution is achieved through peaceful means. Standing on the highest mountains of historical foresight, the decision of how we conceive of our fellow States, construct our trade arrangements, and engage in outer space cooperative ventures will be just as

[641] Immanuel Kant, "Idea for a Universal History from a Cosmopolitan Point of View" in Lewis W. Beck Ed., *Kant: On History* (New York: MacMillian Publishing Corp., 1989) at 20.

important as the decision of whether or not we go to war – for they are not mutually exclusive, but intertwined in a universal evolution time immemorial.

K. Chapter Summary and Conclusions

Without an effective international regime of space goods and technology control, States must protect against unauthorized technology transfers and use through unilateral measures. States supplement their unilateral measures with bilateral and multilateral arrangements, but these arrangements are of limited effectiveness, in large part because they are non-binding and are not purposed to serve as comprehensive international control regimes.

This fractured system of controls is a hindrance to international cooperation in civil and commercial space endeavours. There is no centralized international organization with the authority to provide 'rules of the road' for space actors, coordinate space missions, operate space missions and/or launch services, or undertake technology development. As a result, the interest of the global community is not represented; nor is the broader international community a participant in space activities.

International space law provides guidance on the question of international cooperation and global engagement. Enumerated as legal principles, and often originating from General Assembly Resolutions reflecting the collective will of the international community, these legal principles should serve as objective metrics to measure State action.

Three particular principles of the *Outer Space Treaty* are relevant to cooperation. First is the principle to maintain international peace and security. States are obliged to cooperate as is necessary to resolve such threats. Since the establishment of the United Nations and the modern articulation of this principle, an evolution has occurred in its legal conceptual understanding. Today, threats to international peace and security go beyond traditional inter-State conflict – and into diverse areas. Space law is no exception to this evolution. Emerging threats to international space law include weaponization, space debris, and NEO collision threats. These emergent threats legally justify States to engage in greater cooperation. As these dangers to the international crystallize into definite threats, justification for cooperation will elevate to fully formed obligation.

Second, is the principle to promote cooperation and mutual understanding. As proclaimed in the *Declaration of Principles of International Law Concerning Friendly Relations and Cooperation Among States, "*States have the duty to co-operate with one another."[642] This duty is reiterated in Article III of the *Outer Space Treaty,* obligating States to carry on activities in the exploration and use of outer space, in the interest of promoting international cooperation and mutual understanding.[643]

Third, is the principle that States shall undertake the exploration and use of outer space for the benefit and interests of all countries. This principle holds within it the essential ideal that outer space should be a global endeavor. Manifested within international space law are philosophical principles of humanity that international law should serve human interests. The most important interest for humanity, under international space law, is that outer space is maintained as a province of mankind and not relegated to the terrestrial historical exemplar of sovereign appropriation.

Comparing current State practice to the standards set by these three principles international space law reveals a lacuna. States are not globally engaged in the peaceful use and exploration of outer space. As reflected by the current legal mechanism of space technology trade and controls, the international community operates within a fractured non-harmonized system in which unilateral national security interests are paramount.[644]

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[642] G.A. Res 2625 (XXV), *Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations* (24 October 1970).

[643] Article III, *Outer Space Treaty.*

[644] This does not mean that States are no willing to act in multilateral interests. Rather, States first and foremost consider their unilateral interests and thereafter engage multilateralism. The question of whether States are distinct subjective personalities and whether it is appropriate to categorize States as behavioral entities is beyond the scope of this thesis. It is noted that the scholars of international relations could provide original contributions to the field of space policy vis-à-vis a study of State actions in light of space treaties and security arrangements.

Central to this unilateralism is a self-justified Security Dilemma that perpetuates political attitudes of non-enlightened self-interest.

The United States is currently experiencing the costs-and-benefits of Comsat trade restrictions associated with this dilemma. As discussed in the U.S. Comsat Case Study (Chapter 4, 5, 6, & 7), the U.S has unilaterally imposed trade restrictions in the interests of national security. These trade restrictions, until recently, did not result in significant loss of economic benefit to the United States, nor did they significantly impede U.S. foreign policy goals. However, this exceptional model of trade restriction without cost is now eroding. The pillar behind the U.S. trade policy was that the U.S. held a superior technological lead over foreign manufacturers of Comsats. It was able to dictate to market participants its choice of restrictions on export and re-export controls without fear of economic reprisal. Furthermore, the U.S. achieved a de facto international control regime in space technologies via the enforcement of its export licensing requirements in foreign jurisdictions and against foreign persons. But now the United States is losing its technological superiority. In both the fields of manufacturing and launch services, the U.S. faces strong competition. As a result, its regulatory divergence with key foreign jurisdiction, in particular the E.U., will bring to a close its historical unilateral model. Continuing to regulate *commercial* communication satellites as munitions will result in an economic loss for the United States without a concomitant strategic benefit.

This Security Dilemma is also evidenced in the domestic legal regimes of trade controls that States undertake. As learned in the U.S. Comsat Case Study, the U.S. applies a de facto international regime that is representative of the challenges facing States in order to protect against unauthorized technology transfers and use in light of this Dilemma. Without a comprehensive binding international regime, the U.S. has become myopic, enacting laws and policies to protect their perceived weakness –often termed as threats to national security interests – while failing to form a long-term strategic vision of future. The U.S. is engaging in Comsat export control and trade reform without identifying or challenging the current international paradigm. As a result, space technology trade and proliferation controls are not evolving to achieve the principles of international space law – the principles of peaceful use and exploration, cooperation, peace and security, and benefit for all countries. Instead, the latent emergent characteristics of the international system are guiding State actions.

Absent international engagement towards truly global civil space cooperation there will likely be an evolution towards an oligarchic world order. In the field of space technologies, if left unchecked, this bias should manifest itself as the exclusion of less powerful States from the full benefits of cooperating on space activities, including space technology development. National export control policies of space-faring States will evolve to reflect a preference towards particular oligarch partners viewed as strategic. Discrimination against particular States and the exclusion of non-space-faring States will be justified on the basis of national security, trade, and proliferation concerns.

The way forward for the international community is to advance a global paradigm of space technology trade and proliferation controls. The strategic logic of this global regime is that States benefit more from cooperation and transparency in their space activities than from unilateralism. Linking space technology controls to an outer space disarmament agreement further strengthens this logic. If outer space disarmament is achieved, States no longer have the strategic benefit of unilateral military space technology development and production.

Complementary to a global space technology trade and proliferation regime should be the establishment of a World Space Organization. The WSO should be established as an umbrella organization from which the global community can engage particular space related issues. As an organization not linked to any particular problem, but instead to purposes and principles, this organization can respond organically over-time as new challenges arise in outer space.

A Summary of Thesis Findings

This thesis set out to accomplish several important tasks. First and foremost was to assist political leadership in making decisions with greater consideration of the broader impacts of space technology trade and proliferation control law & policy on global civil space cooperation in light of national security interests. This goal was analogized to revealing unseen pieces of a proverbial puzzle.

The principal method to assess this puzzle was a case study of the U.S. Comsat export control regime. The case study was undertaken in four primary steps:

-First, the international legal environment in which Comsat and other space technologies are exported, traded and controlled was examined.

-Second, an analysis of the unilateral *de facto* international regime of U.S. Comsat export control was undertaken.

-Third, the domestic economic and political implications of current U.S. law were assessed.

-Fourth, the issue of domestic U.S. reform was examined.

The key findings of this case study were:

1) U.S. Comsat export controls are national centric and operate within a primarily unilateral paradigm in which States seek to maximize their legal discretion in exercising space technology trade and proliferation controls. This national centric paradigm is reflected in the absence of a legally binding supra-national space technology trade and proliferation control.[645]

[645] *See* Chapter 2 of this thesis: *International Legal Obligations of a State to Control Exports of Spacecraft and Launch Vehicle Technologies.*

2) The international system of space technology trade and proliferation controls is appropriately characterized as primarily a voluntary system of non-binding arrangements. States rarely enter into legally binding space technology control agreements, doing so only with their most "trusted" strategic allies.[646] In the case of special case of EU regional integration, dual-use items are trusted for regulatory coordination, but those items deemed militarily strategic still remain within the legal discretion of the exporting State.[647]

3) The fractured international paradigm of space technology trade and proliferation controls creates an economic dilemma for exporting States. In light of regulatory divergence, exporting States face the choice of either modifying their export controls to meet the less restrictive standards of their export competitors, or absorbing the economic costs (i.e. loss of commercial exports) associated with stricter trade controls. This dilemma is exacerbated by the phenomenon of economic globalization which increases international competition and accelerates the rate at which markets respond to changes in costs associated with trade control restrictions.[648]

4) The sustainability of unilateral approaches to space technology trade and proliferation controls is questionable. States with technical superiority can temporarily impose unilateral export restrictions without a concomitant cost to their national economy. But unilateral control restrictions create incentives for

[646] *See* Chapter 2 of this thesis: *Export Controls and Sovereign Jurisdictions*, the example of U.S.-Canadian harmonization of export controls. *Also see* the Defense Trade Cooperation Agreements between the U.S. and its closest ally, the United Kingdom. *Treaty between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of the United States of America concerning Defense Trade Cooperation.*

[647] *See* Chapter 4 of this thesis: *European Comsat Export Controls.* The ultimate decision on item categorization for items not listed in Council Regulation (EC) No. 428/2009 is at the discretion of the EU Member State. EU Member States retain authority over export authorization for items designated as military technology and equipment.

[648] *See* Chapter 3 of this thesis: *Economic Globalization.*

foreign States to develop indigenous substitute technologies.[649] In theory, the phenomena of techno-globalization facilitates the indigenous development of substitute technologies by providing foreign States access to human innovation networks that exists beyond the territorial delimitation of exporting States. Furthermore, due to technology advances in transnational human communication networks, the costs associated with benefiting from innovation networks should be lower.[650]

5) The economic benefits from trade, coupled with State divergence on trade controls, results in a fractured international regulatory system in which supplier countries may be in direct conflict. This lack of international export control harmonization increases the likelihood of space technology proliferation at the unilateral discretion of a supplier State.

6) Current thinking on reform of the U.S. export control system reflects a national centric approach. Notably absent in the discourse is the idea of restructuring the international system of space technology trade and proliferation towards a globalized paradigm.

Based on these case-study findings, the thesis then engaged in an assessment of how the current international regime of space technology trade and proliferation controls impacts the ability of States to cooperate internationally on civil space endeavours. It was concluded that without an effective international regime of space goods and technology control, States are compelled by "national security" interests to protect against unauthorized technology transfers and use by unilateral measures. States supplement their unilateral measures with bilateral and multilateral arrangements, but these arrangements are of limited effectiveness, in large part because they are non-binding and are not purposed to serve as comprehensive international control regimes. This fractured system of controls is a hindrance to international cooperation in civil and commercial space

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649 *See* Chapter 4 of this thesis: *Comparative Analysis* and *Chapter Summary. See also* generally the findings of Chapter 5 of this thesis.

650 *See* Chapter 3 of this thesis: *Techno-Globalization.*

endeavours. There is no centralized international organization with the authority to provide ‘rules of the road’ for space actors, coordinate space missions, operate space missions and/or launch services, or undertake technology development. As a result, the interest of the global community is not represented; nor is the broader international community a participant in space activities.

Final Conclusions: Overcoming the Dilemma of National Security and International Cooperation in Outer Space

"*Taking a very gloomy view of the future of the human race, let us suppose that it can only expect to survive for two thousand million years longer, a period about equal to the past age of Earth. Then, regarded as being destined to live for three-score years and ten, humanity, although it has been born in a house seventy years old, is itself only three days old.*"[651]

–James Jeans, English astronomer, physicist, and mathematician (1877-1946)

"*Men might as well project a voyage to the moon as attempt to employ steam navigation against the stormy North Atlantic.*"[652]

-Dionysius Lardner, Irish Scientific Writer (1793-1859)

"*In every revolution there is one man with a vision.*"[653]

-Captain J.T. Kirk

It is concluded that humanity is at an important juncture in its legal-political evolution. The foundational principles of the *Outer Space Treaty* have provided basic guidance for State activities, but they are insufficient to direct States to engage in effective global civil space cooperation. The central issue is a self-justified security dilemma in which States prioritize immediate national security interests over cooperative engagement, resulting in a paradigm of unilateralism with regards to space technologies that retards mankind's collective engagement in the peaceful use and exploration of outer space.

What is needed is for the political leadership of space-capable States to recognize that self-enlightened interest calls for a re-conceptualization of national security interests towards greater international civil space cooperation. This re-conceptualization requires

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[651] Elizabeth Knowles Ed., *Oxford Dictionary of Quotations 5th Ed.* (Oxford University Press: Oxford, 1999) at "James Jeans" 404(17).

[652] Elizabeth Knowles Ed., *Oxford Dictionary of Quotations 5th Ed.* (Oxford University Press: Oxford, 1999) at "Dionysius Lardner" 452(9).

[653] *See* Paul Christopher Manuel, "In Every Revolution There is One Man with a Vision: The Governments of the Future in Comparative Perspective" in Donald Hassler & Clyde Wilcox Ed., *Political Science Fiction* (University of South Carolina Press: Colombia, 1997).

States to adopt new approaches towards space technology trade and proliferation controls that facilitate global cooperation.

To be certain, transforming the current paradigm carries with it particular challenges and opportunities. Historically, the security dilemma associated with technology proliferation has been justified because there is a lacuna in the current *corpus* of public international law that does not effectively ameliorate the security threats associated with unauthorized transfer and use of space technologies. Politically there is the challenge of overcoming asymmetric incentives associated with the continuation of current policy for the benefit of particular domestic constituencies. Economically, the liberalization of trade may negatively impact particular subsets of a domestic space industrial base. But the benefits of effective global civil space cooperation justify overcoming the legal, political, and economic challenges.

Global civil space cooperation will allow the international community to effectively combat emergent threats to international peace and security, threats that in many ways necessitate global participation. The global security benefits of space applications can also be distributed to the broader human population, providing public goods through a diversity of terrestrial activities such as natural resource management, communications, and navigation. Culturally, the identity of a world community will be strengthened through global participation. The inclusion of developing States into space endeavours will also enhance the knowledge of its citizens and inspire a new generation to engage in space-related educational and professional endeavours.

In addition to the immediate benefits gained through cooperation, there is also the impact that adopting a global approach for the use and exploration of space will have on our future. As States venture farther into outer space, establish manned and unmanned bases on celestial bodies, exploit outer space natural resources, and engage in activities not yet imagined, whether or not the fundamental international legal principles of peaceful use, non-discrimination, and non-appropriation remain intact will, in large part, be determined by State practice. Establishing the precedent of global consideration *before*

State practice can erode these principles will be a just service to the evolution of international law.

In this thesis it has been proposed that the way forward for the international community is to advance a global paradigm of space technology trade and proliferation controls. The strategic logic of this global regime is that States benefit more from cooperation and transparency in their space activities than from unilateralism. Linking space technology controls to an outer space disarmament agreement further strengthens this logic. If outer space disarmament is achieved, States no longer have the strategic benefit of unilateral military space technology development and production. Complementary to a global space technology trade and proliferation regime should be the establishment of a World Space Organization. The WSO should be established as an umbrella organization from which the global community can engage particular space-related issues. As an organization not linked to any particular problem, but instead to purposes and principles, this organization can respond organically over-time as new challenges arise in outer space.

But this proposal is only one possible solution and whatever path is ultimately chosen will depend on the enlightenment of the global community. What is most required for global cooperation in outer space is for the community of States, its politicians, its thinkers, its technicians, artists, academics, and most importantly, its people, to awaken to the near limitless opportunities space can provide humanity and courageously assess and overcome the challenges of cooperation.

Epilogue: Future Areas of Research

During the writing of this thesis several areas of research were uncovered that could not be further expanded due to time and length limitations. Each of these areas warrants additional research and development. It is my intention to pursue research in these areas with the goal of providing original contributions in the field of outer space law and policy. The following is illustrative of future areas of research derived from this thesis:

1) Create a quantitative database that can be used to analyze the impact of space technology trade and proliferation controls on U.S. manufacturers.

2) Assess emergent international legal conceptions of humankind/mankind as a distinct international legal personality. Assess parallel legal developments to determine whether there is a broader evolution of public international law towards recognition of mankind as a distinct international legal personality.

3) Investigate non-institutional agreements and arrangements that can facilitate international civil space cooperation (as part of an evolution of the international community towards the establishment of a World Space Organization).

4) Elaborate and analyze possible future WSO charter structures, provisions, and organizational mandates.

5) Investigate human security and its legal nexus to space based applications.

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The End of the Road

A poem on his doctoral studies
by Michael C. Mineiro

The traveler arrived by means unknown
Unremembered form
Delivered upon the Shore

Awakening, eyes slowly rise
Illuminating a beautiful sky
Sharing the horizon - a Road

Brightly shown is this path ahead
Except when darkness covers him
As it often does

No longer concerned with his origin
Mesmerized, the beauty of the land
Captures him holding him tight

Transcendent Illusion

Till one day he comes to the End of The Road
Crying out: "Where I am to go now?"

And in the distance, oh so far away
A gentle voice hears what he prays
"Tis not the first time nor the last
That a traveler will ask…"