Michael C. Mineiro

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Foreword by Ram S. Jakhu

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Foreword

The bilateral paradigm that defined the early days of the space age is no longer. The multiplicity of space actors, the shifting relative share of economic capability, the associated proliferation of space technologies, and the increasing reliance by military, civil, and commercial space communities requires a shift in how the international community engages in outer space. Space technology export controls are still based on a unilateral paradigm of State engagement in outer space. While cooperation does occur, it is typically limited as not to require technology development or transfer internationally, and as a result the international community is yet unable to fully synergize their respective capabilities in the peaceful use and exploration of outer space. The research and findings of this book address those issues comprehensively in light of the evolving nature of international space law and relations as well as rapidly emerging globalised world.

In a number of ways this book is a unique and excellent exploration of the nexus between international cooperation in outer space, national security, space technology, general public international law, and international space law. It seeks to illuminate the underlying legal, political, and technical factors impacting international cooperation in outer space. Dr. Michael C. Mineiro has brilliantly analyzed this complex nexus from an objective perspective and has made several practical and viable recommendations.

I strongly recommend this book to all that are interested in the study and practice of law and policy related to space exploration and utilization of outer space; be they students, teachers, lawyers, aerospace professionals and managers, diplomats, or policy and law makers. Undoubtedly, they will find this monograph a very useful source and an important tool for their professional pursuits.

Montreal, QC, Canada — Ram S. Jakhu

Preface

International cooperation in outer space is central to mankind's continued peaceful exploration and use of outer space. The traditional hegemony of only a handful of States with space technology is eroding. Emerging space powers such as Brazil, China, and India are increasingly developing sophisticated space technologies and applications. Traditional space actors, such as the United States, will need to engage in broader international cooperation in order to maximize benefits and minimize costs.

This proliferation of civil space technology is a positive development. As humanity achieves more global participation in outer space, the resources allocated to civil space activity should increase and diversify. From a communal perspective, the totality of benefits of our peaceful exploration and use of outer space will improve as international cooperation results in improved space technologies and applications.

Central to international cooperation in outer space is the underlying space technologies that support exploration and use. Civil space technologies have a close relationship to military technologies. This dual-use nature of space technologies raises concerns of proliferation and unauthorized use as States develop international cooperation. As a result, States are selective in their international engagement.

The fundamental finding of this monograph is that a lacuna exists within general public international law that perpetuates a self-justified security dilemma that in turn inhibits greater international cooperation in outer space. This lacuna is manifested in domestic space technology export control regimes and associated international export control arrangements. This lacuna is also evident in the failure of particular legal principles of cooperation as enunciated within international space law from receiving full engagement.

It is my hope that the knowledge developed in this monograph will assist the international community in successfully fulfilling the principles of Article I of the *Outer Space Treaty*, in particular the principle that the peaceful exploration and use of outer space shall be carried out for the benefit and in the interests of all countries.

Montreal, QC, Canada — Michael C. Mineiro

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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 (e.g. 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.

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

[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>.

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 monograph, 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 monograph 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 Monograph

This monograph 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?

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 monograph. 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

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

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 monograph, 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.*

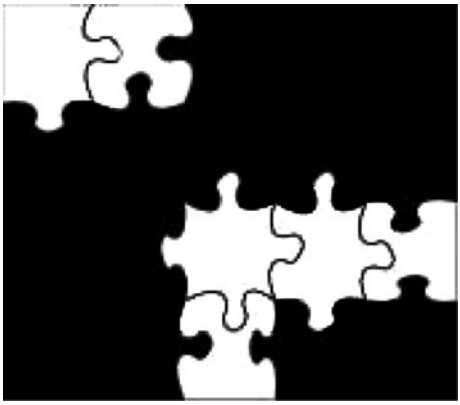
The Analogy of a Puzzle

Attempting to understand the nexus between export controls, national security, space technologies, and international cooperation is a daunting task. In many ways this monograph 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 monograph 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 monograph 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.

Contents

Acronyms and 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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Part I
An Examination of Preliminary Concerns – Contextual Lenses

The purpose of Part I 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 1
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.

1.1 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.[1] In the broadest sense it is "the specialized aspects of a particular field of endeavor <educational

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

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